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MOTOR AGE

MOTOR TRAIL FROM NEW YORK TO SAVANNAH

By Pathfinder

Motorists who contemplate touring from New York to Savannah will find the accompanying article shows the best route between the two points, the stretch between Atlanta, Ga., and Roanoke, Va., being hitherto unknown to but a few tourists.

NEW YORK, Nov. 2—Not all the enthusiasts who will witness the great road race carnival at Savannah at Thanksgiving time will go there by train; there are hardy motorists who will scorn to travel over the rails and who will take advantage of the opportunity to make the trip in their own motor conveyances, a journey which will be particularly interesting because of the fact it will lead the tourist through lands strange to him and over roads that will appeal to him because of their varied character. Unfortunately, though, few know the way from New York to Savannah, a distance of 1,274 miles, but the writer, from personal knowledge and experience, can vouch for the following route being the best:

New York to Philadelphia	108
Philadelphia to Gettysburg	120
Gettysburg to Hagerstown	34
Hagerstown to Winchester	53
Winchester to Staunton	93
Staunton to Roanoke	88
Roanoke to Winston-Salem	121
Winston-Salem to Charlotte	85
Charlotte to Anderson	148
Anderson to Atlanta	136
Atlanta to Macon	102
Macon to Savannah	186
	1,274

In dry weather, a good, amply-powered touring car should be able to average about 150 miles a day for the entire journey. In rainy weather I believe that there are not many tourists who would average more than 75 miles a day south of the city of Roanoke.

Readers of Motor Age will remember the series of articles which I wrote last winter, describing my tour from New York to Savannah. It will be recalled that the route which I covered at that time was by no means the most direct but led eastward over the national highway to Columbus, O., and then southward by way of Cincinnati, Lexington, Louisville, Nashville, Huntsville and Chattanooga to Atlanta and thence by way of Macon and Statesboro to Savannah. My idea at that time was not to travel by the shortest route but by that which offered the most interesting sights and scenes. Furthermore, in a tour which I made 2 years ago, I traveled via Philadelphia and Gettysburg to Hagerstown and then down the Shenandoah valley by way of Winchester and

FERRY ACROSS THE SAVANNAH RIVER

MACADAM NEAR CHARLOTTE

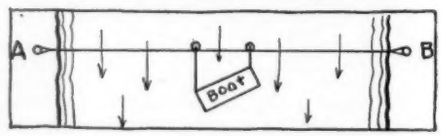
TYPICAL SOUTH CAROLINA WATER POWER DEVELOPMENT

Staunton to Roanoke, Va. It recently occurred to me that if I could map out a desirable route between Atlanta and Roanoke, I would then be able to supply my fellow tourists with complete data for touring by a direct route between New York and Savannah. This I have done.

Through the courtesy of Thomas A. Edison, who 2 years ago spent several weeks in touring through the Carolinas in his two White steamers, I obtained considerable information regarding the roads in these two states, and equipped with this data, I last week set out from Atlanta to drive to Roanoke and thus cover the "missing link" between New York city and Savannah.

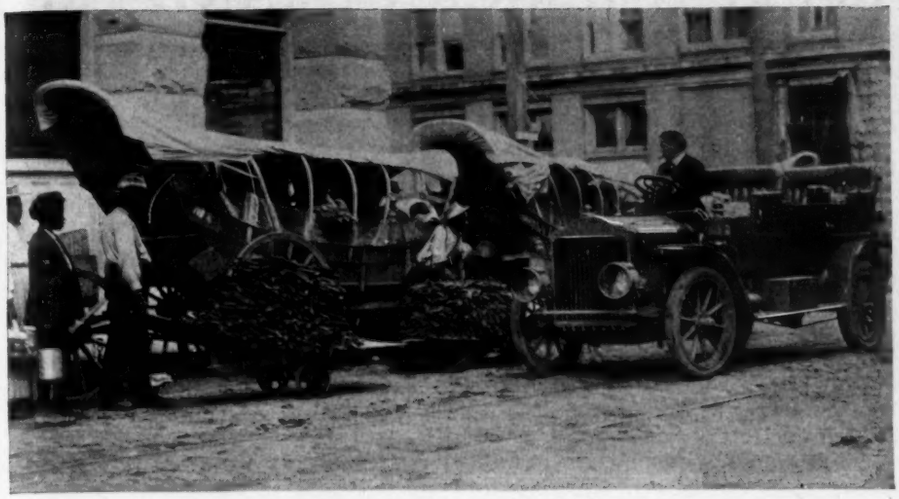
Georgia roads are bad—unpardonably so—except in those few counties in which the large cities are located. If I may digress for a moment, I would like to point out a recent happening in that state which points toward a rapid improvement of its highways. There had grown up in Georgia what is known as the "convict lease" system, whereby the convicts were leased to "convict brokers" at a nominal sum by the several counties. The brokers, in turn, leased out the convicts to the owners of mines, brick-yards and lumber-camps who worked the convicts "to the limit." As a result, a limited number of very influential citizens and office-holders benefited greatly by the system and the convicts were never sent out to work on the roads except in three or four counties. The abuses of the "convict lease" system became so pronounced that a vigorous campaign against it was started a few months ago by an influential newspaper, the Atlanta Georgian. As a result of this campaign, which opened the eyes of the people of the state to the iniquities of the system, the governor convened the legislature in extra session and the "convict lease" system was annihilated by statute. Therefore, there is now nothing for the convicts to do but to work on the roads. If one county cannot use all of its own convicts on its own roads, it must lend them to any other county which applies for them. Thus it happens that an impetus has been given to the good roads movement in Georgia.

The good roads, however, are yet to be built and on that drizzly October day when I set out from Atlanta I found it necessary to put the tire chains on the wheels of my White steamer to prevent skidding off the slippery clay roads. The roads are not all of clay There are many miles of sandy roads with deep ruts made by the farmers' wagons, all of which travel in one track. This is the time of year when the cotton crop is being marketed, with the result that I met countless teams on the road. In many instances meeting a team meant that I had to stop the car and lead the horses or mules by the machine or, perhaps, wait until the driver could turn into some cross road or "take to the tall timbers." Under such conditions the progress of the tourists is necessarily rather slow. The route led by way of Lawrenceville, Winder, Jefferson and Royston to Hartwell. Six miles beyond the latter town I crossed Brown's ferry across the Savannah river into South Carolina. By an ingenious arrangement the current of the river operates the ferry. A cable is stretched from shore to shore, well above the level of the river, and the ferry-boat is connected by two chains to sheaves which run on the cable. By altering the relative length of the two chains the angle of the ferry-boat to the stream is changed so that the current moves the boat in either direction which may be desired. I can best illustrate the principle of the automatic ferry by the following diagrams, in which the arrows indicate the direction of the current:



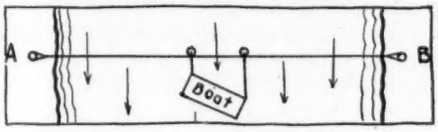
TYPICAL SOUTHERN COTTON MILL, SUGGESTIVE OF NEW ENGLAND

STARTING OUT FOR 'POSSUM



IN THE TOBACCO MARKET AT WINSTON-SALEM

With the chains in this position the current carries the boat from A to B.



With the chains in this position the current carries the boat from B to A.

I might say here that in our entire journey from Atlanta to Roanoke, a distance of 490 miles, one hardly can find 100 yards of level country at a time. I always was going either up hill or down hill. In Georgia the grades are sometimes very steep—dangerously so, it seems, as one guides his car down a winding road with a surface of wet clay and a deep ditch at either side. But as soon as I crossed into South Carolina I noted that the roads had been laid out much more carefully. The road surface was not much better than was found in Georgia, but the gradients were very much less, I found.

CONFEDERATE MONUMENT AT GREENVILLE

Anderson was the first important town I passed through in South Carolina and next I reached Greenville, a hustling city located 167 miles from Atlanta. As far as Greenville, I had been cutting "cross country" in the sense that I had not followed any line of railroad. At Greenville I struck the main line of the Southern railroad and for the next 150 miles, or as far as Salisbury, N. C., I seldom was very far from the main line of this road.

On I went through the cotton fields, past the cotton mills, through Spartansburg and Gafney and Blacksburg, and then I crossed the state line into North Carolina near the town of Grover. Next I passed through Bessemer City, Gastonia and Belmont and then—*mirabile dictu*—I was on a macadam road! For the first time since I left Atlanta the hand of the speedometer passed the 30-mile mark—and kept going. I slowed down again when I met the chain gang, which was busily engaged with stone crusher and steam roller, building more macadam, leading to the ferry another of those automatic affairs which takes us across the Catawba river. I was back on the macadam and in a jiffy I had covered 11 miles, which took me into the center of Charlotte, 284 miles from Atlanta. I drove from Charlotte to Salisbury, a distance of 46 miles, in a little over 2 hours.

The macadam road lasted for a few miles north of Salisbury and then I came once more to a section where the roads are as yet left to take care of themselves.

IN VIRGINIA WOODLANDS

Forty miles beyond Salisbury I came to the quaint town of Winston-Salem, famed as a tobacco market. Tobacco wagons by the hundred lined the streets waiting to discharge their fragrant cargoes at the warehouses. I was told that over half a million pounds of tobacco were brought in by the farmers on the day that I passed through the town. Leaving Winston-Salem, I had a stretch of 12 miles of flawless macadam road to Kernersville, the last I was to see on the trip. From Kernersville I turned due north and traversed a fair dirt road through Oak Ridge and Stokesdale to Madison. From this point on I had rather poor going. Thirteen miles north of Madison I crossed the state line into the state of Virginia, and during the rest of my journey the roads were quite as bad as in the state of Georgia.

I followed a single-track railroad due north as far as Martinsville. Up to this point I had been traveling on the eastern side of the Blue Ridge mountains which run practically parallel with the coast. The task which now lay before us was to cross this range into the Shenandoah valley. The road across the mountains would probably be reasonably good in dry weather but it was raining when I made the trip, with the result that the going was very heavy and slippery.

SOUTHERN COTTON PICKERS AT WORK

TWENTY-ONE CARS IN AMERICAN GRAND PRIX

NEW YORK, Nov. 3 — Twenty-one entries for the American grand prix, which will be run under the auspices of the Automobile Club of America at Savannah on Thanksgiving day, and nineteen for the light car event the preceding day, make it look as if the Georgian carnival will be a stupendous affair. The lists closed formally yesterday and there are no more grand prix entries in sight, the contest committee declares. Four countries are represented—America, Germany, France and Italy, the last named having six cars, the others five each, the list being as follows:

ITALY

Fiat	Louis Wagner
Fiat	Felice Nazzaro
Fiat	Ralph de Palma
Itala	Henri Fournier
Itala	Alexandre Cagno
Itala	Giovanni Piacenza

GERMANY

Benz	Victor Hemery
Benz	Rene Hanriot
Benz	Fritz Erle
Mercedes	W. Poegge
Mercedes	G. Salzer

FRANCE

Clement-Bayard	Lucien Hautvast
Clement-Bayard	Victor Rigal
Lorraine-Dietrich	Arthur Duray
Renault	Francois Szisz
Renault	Lewis Strang

AMERICA

Acme	Cyrus Patschke
Lozier	Harry Michener
Simplex	J. M. Seymour
National	Not named
Chadwick	Willie Haupt

At practically the eleventh hour three American entries were made that will fill the gap caused by that number of withdrawals and give to the United States a team of five cars. The nomination of the Chadwick, that distinguished itself during the middle stages of the Vanderbilt cup race, with Willie Haupt for its driver, was made almost immediately following the Long Island contest. On Monday, the day set for the closing of the Savannah entries, a Simplex and a National were added to the list.

The Simplex is nominated by Charles A. Singer. It is the same car that won the Brighton Beach 24-hour race on October 2-3, scoring 1,177 miles, a new record. Joseph M. Seymour, who drove a Simplex with credit in the Briarcliff race, is named as its pilot.

The National that has been nominated is a six-cylinder car of 70 horsepower. Negotiations are in progress to secure a star driver, but so far the company has not made its announcement. It will be remembered that a National held for several years the 24-hour track record.

The announcement of the withdrawal of the Matheson and Locomotive cars has been made and an official statement issued that the B. L. M. would not start. "We entered the Vanderbilt race without adequate preparation," said C. W. Matheson, president of the Matheson Automobile Co., "and have no intention of repeating our mistake at Savannah. The factory is too busy getting out our 1909 cars to be able to tinker further with our racing machine. It will, however, be thoroughly prepared and tuned up next spring and will be a contender in all the big events of the 1909 season."

The entry of the Locomotive was made by Louis J. Bergdoll, Philadelphia agent for the car, who withdrew it, as he had planned to drive a Chalmers-Detroit in the light car race. The B. L. M. was never really seriously regarded as a likely competitor in this race.

Up to Saturday seven of the European drivers had arrived. Alexander Cagno and Giovanni Piacenza, who will drive Italas, came in on the Koenigin Louise on Thursday. La Lorraine, which arrived on Saturday, brought Felice Nazzaro and Louis Wagner, of the Fiat; Lucien Hautvast and Francois Szisz, of the Clement-Bayard, and Arthur Duray, of the Lorraine-Dietrich team. It is expected that before the week closes all of these drivers will be installed at their training quarters on the Savannah course. Of the seven arrivals, four have been winners of classic international races—Nazzaro and Szisz, of the grand prix in 1907 and 1906; Wagner, of the Vanderbilt in 1906, and Duray, of the Ardennes circuit in 1906. Hemery, who won the Vanderbilt in 1905 and the Ardennes the same year, and will drive a Benz, is expected this week. Fournier, who will pilot an Itala, is due this week.

The officials of the Long Island motor parkway have offered the use of the course for tuning up and practice, agreeing to keep it clear of all vehicles from 6 to 9 o'clock in the morning.

An invitation was extended to William K. Vanderbilt, Jr., who has been referee at all the international races in this country, by the A. C. A. contest committee to serve in the same capacity at Savannah. Mr. Vanderbilt declined, pleading poor health as an excuse.

Paul La Croix and Sidney B. Bowman, representing respectively the Renault and Clement-Bayard in this country, sailed for Europe last week, but will return in time for the Savannah races.

The date set for the closing of the nominations for the light car race, which will be run on Wednesday, November 25, was Monday. That day nineteen entries had been made as follows: Four Maxwells, four Buicks, three Oldsmobiles, two Chalmers-Detroits, one Cameron and an American Aristocrat, while the foreigners are the Lancia, Isotta, Gregoire and S. P. O. The Gregoire is the same one that took part in the French grand prix voiturette race and it is said it will be driven by George Robertson, while his rival, Herbert Lytle, will be at the wheel of the Isotta. Juhanz will drive the S. P. O., which he also handled in the last Brighton Beach 24-hour race. Bergdoll in one of the Chalmers-Detroits and Burman and Hearne in two of the Buicks are among the other drivers who will participate.

Among the last machines to arrive for the light car race will be the Lancia and the S. P. O. Signor Lancia was given short notice, but cabled he would be able to get through a car in time. A small Lancia stock car will be sent to Savannah for Hilliard's practice and possible use in an emergency. The S. P. O. agents did not cable for a car to enter the curtain-raiser until last week.

In addition to the City of Savannah, which the Automobile Club of America has chartered outright, the club has reserved all the cabin space in the City of Columbus, which will also sail the Saturday before the race. The promoters of special trains on the Seaboard Air Line and the Atlantic Coast Line, which will also serve as hotels during the races, already report large reservations of space.

German Drivers en Route

Paris, Oct. 27 — Hemery, Henriot and Erle, the three pilots of the Benz cars entered for the American grand prix at Savannah, will sail with their racers on October 29 for New York, en route for Georgia. While all the French and the Mercedes racers are believed to be the same as at Dieppe, the Benz trio have been fitted with new engines of the maximum bore and a stroke of 200 millimeters. Victor Breyer, the European representative of the American Automobile Association, will sail for New York November 14 on the French liner Provence. Stress of business prevented Mr. Breyer sailing in time for the Vanderbilt race; he will be a spectator, however, of the Savannah contest.

GRAND PRIX COURSE PICKED

Paris, Oct. 29 — Chateauland is practically decided upon as the scene of the next grand prix. This week a deputation from the town of Angers waited on the racing board, gave particulars of its local organization, the progress made towards the collection of the $20,000 subvention, and asked for a definite answer. Though no official decision was given, it is understood that after a final visit of the course by the members of the racing board the Angers triangle will be accepted. Already a large plot of land has been picked out for grand stands at St. Germain des Près, about 12 miles from the town of Angers. As the stands will be on the outside of the course and the gasoline station on the inside, it will be possible to arrive at headquarters at any time during the race. A good road from Angers reaches the grand stands by following the banks of the Loire river. Although 185 miles from Paris, in a south-westerly direction, the general situation of the Angers course is so favorable that spectators are expected to be almost as numerous as at Dieppe. Saumur is only 25 miles to the east along the beautiful Loire valley; Tours is about 65 miles away; Blois is not more than 95

miles away; Le Mans is about 50 miles to the north, and all around are small towns capable of providing excellent accommodation for tourists. The course selected is roughly triangular shaped, two sides being straight and the third rather winding, the total distance round being 46.1 miles. It is believed that with such a length not more than seventy-four cars should be allowed—one car per kilometer. If, as is quite possible under the reduced bore regulations, this number should be exceeded, the club would limit the entries to two per firm. Owing to the troops now serving but 2 years with the colors, it will be impossible this year to protect the grand prix course by military, as on previous occasions. It has been decided, therefore, to employ gendarmed, mounted and on foot, for the most crowded portions of the course, to swear in the greater portion of the 600 road menders of the department, to employ a large number of policemen, and to put club officials at various points around the road race course.

MORE GLORY FOR LOCO

Los Angeles, Cal., Nov. 2—Special telegram—The first 24-hour race ever run on the Pacific coast proved a huge success, no one being injured and the contest being remarkable for the showing made by the tires. Seven cars contested and their total mileage was 3,662 miles at racing speed, yet only five tire changes were reported. The race was won by a Locomobile, driven by Murray Page, which covered 921 miles, Page sticking to the wheel 21 hours. R. J. Leavitt, the 280-pound representative of the Locomobile here, drove the remaining 3 hours. Second to the Locomobile was the Franklin six, with 836 miles. The Studebaker had 628 and the Reo 474. The Chalmers-Detroit Bluebird, Pope-Hartford and Sunset retired before the finish, the Sunset going through the fence Sunday night. The track itself is a new one and hence the mileage of the winner is considered excellent by the critics who saw the race.

DETROIT RUN ABANDONED

Detroit, Mich., Nov. 3—On account of the scarcity of 1909 models now in the city, the Detroit Automobile Dealers' Association has been forced to cancel its endurance run, scheduled for the present month, and will from now on push the arrangements for the coming show of the organization, the second event of the co-operative character in local history. From present indications Detroit will again have two shows this winter—one by the D. A. D. A., which will probably take place in the Wayne pavilion downtown, the other in the Light Guard armory, under the auspices of the Tri-State Automobile and Sportsman's Show Association. The D. A. D. A. reports a balance of $1,700 in the treasury as the result of last year's show and the membership fees, and will shortly declare a dividend of $1,300.

WINS IN PACKARD CAR

G. B. Fletcher Captures Second Leg on Brazier Cup in Philadelphia's Legal Limit Run

Philadelphia, Pa., Nov. 2—That eastern motoring classic, the Brazier cup contest, that in antiquity, if not in importance, exceeds even the Vanderbilt cup race, was decided on Saturday last over a 65-mile course, which gave the contestants a liberal variety of road conditions and an opportunity of exhibiting judgment as to pace. The field was a small one—only nine starters—but the affair was carved out with a minuteness of detail that reflected great credit on the officials.

Gustavus B. Fletcher, in a Packard runabout, who won the 1905 contest, repeated on Saturday, and was adjudged the winner, his penalties being the lowest—17 minutes, 30 seconds. The contest committee called the affair a "legal speed limit run," and when it is remembered that the route lay through twoscore villages, towns and townships, with a bewildering variety of speed ordinances to remember and adhere to, it is not to be wondered at that a clean score was a rara avis. To assist the contestants the committee allowed them not only to carry watches and speedometers, but supplied each of them with a speed chart as a partial guide. This chart divided the route into thirteen sections, in each of which the average legal speed limit was set forth. Open country permitted of a 20-mile speed, and but two short sections of the thirteen allowed of that limit. It was amusing to see each contestant and his assistant, watches and cards in hand, keeping tab on mileage and speed in an effort to land the cup. That the winner was nearly 18 minutes shy of the actual figures as decided upon by the committee is an indication that judgment of speed among motorists generally is not a common commodity.

In arriving at their decisions the judges used the times recorded by watchers at three blind controls, who must have been well secreted, for the newspaper men in Wayne Davis' Matheson could see nary a hide or hair of them, although they kept a sharp lookout. Cars that arrived at these secret controls and at the finish ahead of or behind their allotted times were penalized in minutes and seconds, and the sum total of these derelictions furnished the final scores upon which the decision was arrived at.

Confetti was scattered at each turn, but in many instances the 35-mile northwest gale which prevailed throughout blew most of the markers into the next county, and it required veritable Sherlock Holmes work to descry among the dead leaves at the side of the road a telltale bit of the paper which rude Boreas had somehow overlooked. Many strayed from the route in consequence, which probably will account for any delays in arriving at the controls and finish. Most of the penalties, however, were imposed for early arrival, for whenever a contestant went astray he immediately "beat it," and usually more than made up the delay.

An idea of the moderateness of the pace may be had from the fact that the Matheson press car, which started absolutely last and stopped several times en route to allow the benumbed pressmen to thaw out their frozen bearings, reached the head of the line at the 40-mile point. It is to be feared, however, that Wayne Davis, who was at the wheel, and who was untrammeled by schedules, may have ignored in one or two instances the speed ordinances of the villages and townships, despite the fact that almost the entire route lay through the "trap country." Nothing that looked like a trap, however, could be seen from the press car, whose occupants were on the lookout.

None but members of the Automobile Club of Philadelphia was eligible to compete, and owners were drivers in every instance. The following summary will explain matters:

Car		Penalties m. s.
Packard	G. B. Fletcher	17 :30
Winton	H. P. Bailey	18 :30
Pennsylvania	C. Y. Abbott	22 :00
Elmore	F. Hardart, Jr.	22 :00
Buick	Horace Allen	32 :00
Packard	E. L. Miller	52 :00
Pope-Hartford	John D. Airl	71 :30
Franklin	*John B. Curtis	
Autocar	*W. S. Harding	

* Did not finish.

This was the sixth contest for the cup, A. H. Chadbourne having won the first, December 5, 1903; C. H. Gillette the second, October 1, 1904; Gustavus B. Fletcher the third, October 7, 1905; George L. Mayer the fourth, October 30, 1906, and Alan Wood, 3d, the fifth, November 2, 1907.

PARIS PACKARD BRANCH MOVES

Paris, Oct. 25—Present quarters proving altogether inadequate for growing needs the Packard Paris branch called in the removal men this week and transferred the establishment from the Cité de Pusy to 177 Boulevard Peraire, further in the motor district and more easily accessible from the central part of the city. H. D. Wilson, the Paris agent of the Packard Motor Car Co., reports that the number of cars of its manufacture visiting Europe this year is larger than ever before. Though requests for repairs are always light, it was considered necessary, by reason of the number of callers for information and assistance, to seek more suitable quarters. The only reason for founding the Paris house was to be of assistance to Packard tourists in Europe; thus at the new establishment a complete stock of parts is maintained in readiness for shipment at a moment's notice, and a repair shop is at the disposition of those who may need it at any time during a tour of the continent.

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Lock-Nutting and Cotter-Pinning

ONE of the most pronounced advances in motor car construction during the past 12 months is the universal locking of nuts in place, whether this is done by using the conventional hexagon head nut or using the common nut and securing it by lock nut or the practice followed by several makers of using a locking washer. In all cases the result is the same, and by extraordinary precaution in this part of motor car construction the makers have indirectly benefited to a very great extent the entire machine. One of the greatest troubles that arose from lack of lock-nutting or cotter-pinning was the continued breaking of spring leaves, which invariably happened on the third or fourth day out on a run, and which was due directly in a great many cases to the lock nuts on the spring clips holding the springs to their seatings working loose. So long as the clips remained at their original tightness there was no danger of leaves breaking, but just so soon as the slightest looseness occurred a broken leaf or two was the result.

Carelessness Often the Fault

OBSERVATIONS in many endurance contests have shown that a failure in proper lock-nutting is often not due to engineering oversight, but to negligence on the part of the factory workmen and superintendents. One example will illustrate this: Two cars of the same make in every respect were competing in the same tour; one developed spring trouble on the third day, resulting in broken leaves, and it was discovered that the clip bolt nuts on this car were not lock-nutted at all; whereas, those on the other car were. An inquiry with a factory representative showed that these nuts on both cars should have been lock-nutted, and the reason one was and the other was not was traceable directly to carelessness on the part of one of the factory department heads. An inspection of the car on which the spring clip nuts were not lock-nutted showed that on all four springs these were not sufficiently tight; whereas, on the car with its spring clip nuts properly lock-nutted everything was in perfect shape. The majority of American factories now carefully secure every nut, whether on the back axle, the chassis frame, the engine feet, gearbox supports, radiator supports or body parts.

Varied Locking Means

IN the majority of well-made cars varied locking means are used. For example: In a well known licensed make of car, in which all nuts, bolts and screws are so fastened as to make a change in adjustment or their loss impossible castellated nuts with cotter-pins are used on many of the chassis parts; but, on engine bases and dust plates, where cap screws are used, these screws are laced; and, where a magneto is held down, the screw holding it in place is double nutted. Where particular precaution is needed this maker uses nut and lock nut as well as cotter-pins. Another equally important maker locks every nut by a spring washer beneath the nut and uses the cotter-pin as well. It is common custom in places where a nut has to be frequently adjusted, instead of using the castle head with cotter-pin to serrate the edge of the nut and use a pawl actuated by a spring. The policy followed by other makers is, in case of through bolts, in which case a cotter-pin is not objectionable, the regular hex head and cotter-pin are used. In other instances where the cotter-pin is objectionable, an example being the front spring bolt passing through the end of the frame, the nut is set down against a shoulder and the bolt lightly peened over to give a smooth finish. It is not uncommon usage where a nut is on a stationary part, particularly where a stud is used, to provide a spring washer.

The Dictatorial Race Driver

ARE we reaching a crisis in connection with the driver problem in road races? Is that time at hand when the manufacturer of a car must meet the wishes of the driver as to the make of tires the car carries, as to the grade of oil it uses, as to the make of magneto fitted, and as to the type of shock absorber used? Is it a fact that the interests of many car manufacturers who enter road races are jeopardized to a certain extent because of cash premiums offered by different accessory makers for the winning car carrying their particular make of accessory? Many students of several of the road races of this season have raised this point, the reason for such being based on their own observations before and during the race, as well as certain other factors coincident with the race.

Drivers Demand Accessories

IT is fact that certain drivers refused to handle their car in a recent race if the maker of the car did not agree to put on a certain make of tires, the manufacturer of which had posted a good premium for the winner. It is further a fact that other drivers refused to do their best unless a particular type of magneto was fitted, coupled with the use of which was a rumored premium. If American drivers become so dictatorial as this it will not be long before certain car manufacturers will refuse to compete in contests because of the impossibility of adhering to such demands. To get at the root of the trouble the original cause may be found with the accessory manufacturer, who, in order to get his goods well represented in the contest, offered the cash prize. Viewed from the accessory manufacturer's point of view this is considered aggressive business, but from the sporting point of view it is decidedly dangerous, and from the driver's point of view savors very much of a form of graft. If continued, it will in not a few cases work considerable hardship, not only to car makers but to other accessory manufacturers who do not feel called upon to resort to such measures.

Called Legitimate Advertising

IN the majority of cases this cash premium proposition passes as legitimate advertising and is so entered up in the books of the company. Viewed purely as such it is perfectly correct and legitimate; but, if it works an injury to some of the entrants who have more at stake in the contest and who pay the $1,000 entry fee, then it should be restricted and prohibited. The aggressiveness of certain makers has gone still further, and reports have it on good authority that cases are on record where certain accessory manufacturers have approached drivers and have offered them big premiums not only if they won but if they even consented to use their particular accessory. This is exceedingly dangerous, and will work an injury to American road racing if it is continued. But there is the driver's side also. There is equally sufficient proof that during the present season a driver has been guilty of going to a certain accessory manufacturer and throwing down the ultimatum of either giving him a cash premium for using his accessory or the driver would not handle the car. This state of affairs is equally ruinous. If the driver is to be a go-between, from accessory manufacturer to car entrant, with his hand outstretched for graft in both directions then it is high time that the American Automobile Association took command of the situation and corrected this abuse. The association will need the assistance of both the car entrant and the accessory maker and there is no reason why both should not be glad to embrace the opportunity and correct a grievous evil. So long as road racing is kept free from such actions it will be a sport of the highest class and be a big attraction.

NEW RULES FOR THE WORLD'S ROAD RACES

Changes Made in International Regulations by Association of Recognized Automobile Clubs

PARIS, Oct. 27—Next year's international racing cars must not exceed 130 millimeters, or 4.26 inches, bore for four-cylinders, and must weigh not less than 900 kilos, or 1,984 pounds. Six-cylinder engines will be allowed a bore of 106 millimeters, and the same minimum weight of 900 kilos. Motors of the Gobron type, two pistons per cylinder, will be admitted. These decisions being arrived at by the International Association of Recognized Automobile Clubs, will be in vogue for all the great speed contests of 1909, including the grand prix of France, the Italian races, the Ardennes race, the grand prize of the A. C. A., and, if Britain decides to hold another speed contest, for that country also.

When the meeting opened, with delegates present from France, Germany, America, England, Belgium, Italy, Switzerland, Spain, Austria, Hungary, Portugal and Egypt, it was agreed that the method of regulation should be by limitation of bore. England alone held aloof, declaring that power and not bore should be limited. French delegates had instructions to insist on a maximum bore of 140 millimeters; Italy, Germany and Belgium were known to be strongly inclined towards a maximum bore of 130 millimeters, on the ground that engines of this size would furnish an average speed of 70 miles an hour, which was quite sufficient for the public. The French objection to a very small bore appeared to be that the greater the limitation the greater the departure from commercial models, or from models giving experience for everyday use.

There was a long fight before a common meeting ground could be arrived at, France finally abandoning its bore of 140 in favor of 130, but maintaining its minimum weight of 900 kilos. Germany held for 130 bore and 1,000 kilos weight, and Italy tried to reconcile all parties by 135 millimeters and 900 kilos. On a vote being taken the French proposition was adopted, Germany and Italy dissenting.

Under the new regulation, which will be the international law for 1909, no race —other than a local event—can be held with racers having other than 130 millimeters bore and a minimum weight of 900 kilos empty. The cars will be lower powered than those of the present season, when the 155 millimeters rule was in force, but it is doubtful if they will be much slower. At Bologna, last month, where a 130-millimeter race was held, the winner averaged 65 miles an hour with a bore of 120 and a weight of 1,200 kilos, while several faster, but less regular cars, attained over 90 miles an hour on a straightaway. Speed, therefore, will be high, despite the drop from 155 to 130.

By reason of the lower minimum weight it may be expected that tire trouble will be considerably less than at any of the preceding international races, where the cars have always been at the limit of their pneumatics. The question of rims and tires came up for discussion at the conference, Marquis de Dion for France and Mervyn O'Gorman for England asking that demountable rims should be forbidden, in order to force tire manufacturers to improve their product. The banishment of rims would of course entail the abandonment of demountable wheels that England has been asking for during the past 2 years. René de Knyff was inclined to favor the ban on quick-changing devices, but would not pronounce definitely until he had consulted his colleagues of the sporting commission. Finally it was decided to hold over the question until the next meeting, to be held November 30, during the Paris salon.

After hanging fire for 2 years the Gobron question was forced on the meeting and a decision arrived at in favor of multiple piston engines. Under the old Gordon Bennett rules the Gobron motor was, of course, admitted. When, for 1906, it was decided to limit the bore the regulation was so worded that it was practically impossible for the Gobron engine, with two pistons per cylinder, to compete. Last year the same attitude was persisted in; this year, however, a strong stand was made, and the conference finally decided to allow the Gobron, with its two pistons per cylinder, to compete on the same footing as engines of the usual type.

The voiturette regulations were quickly settled, this matter being of important interest to France alone. For single-cylinder engines a maximum bore of 100 millimeters was maintained; two cylinders were given 80 millimeters, and four cylinders allowed 65 millimeters. Instead of 600 kilos minimum weight an increase was made to 800 kilos, or 1,763 pounds.

It had been decided by the international road congress to limit road signals to four only. The German club, therefore, brought forward a similar proposition and submitted the signals that it considered most suitable, these to be adopted as far as possible by all nations. In view of negotiations now carried on by the Touring Club of France and the Association Générale Automobile, the question was postponed until the November meeting. An attempt to arrive at a formula for touring cars was also postponed, and the British proposition to revive the Gordon Bennett conditions met with a firm refusal. Norway made application to be admitted into the international conference and was welcomed.

An official decision regarding the Anjou course for next year's French grand prix may be expected this week. Indications are that the set of roads in the Chateau country will be adopted, but it is not yet known exactly how the course will be laid out. As the result of the reduction of bore a larger entry than usual is possible for the grand prix, and if, as is already proposed, the Automobile Club of France decides to reduce entry fees to $800 per car, $1,800 for a team of three, and to offer handsome cash prizes from eighty to 100 starters can be counted on. Such a number of cars would necessitate either a larger course or an eliminating race. It will, therefore, be necessary to arrive at a definite conclusion regarding the race before selecting the roads.

Milwaukee Has Glidden Bee

Milwaukee, Wis., Nov. 2—Milwaukee wants to be included in the route of the 1909 Glidden tour, and it wants this favor badly. So every member of the Milwaukee Automobile Club, agents, manufacturers and owners, will petition the A. A. A. to make Milwaukee a stopping point. Secretary James T. Drought, of the M. A. C. returned from New York with the news that the A. A. A. was favorably disposed toward the plan, but the manufacturers were not, and now every effort will be made to influence the latter. Even if Milwaukee does not get the 1909 tour, it will make a strong bid also for the 1910 tour to include the Beer City. If Milwaukee is given a place on the circuit it is not at all improbable that efforts will be made by the local club to organize a team to compete for the Glidden trophy. Such a scheme is already being talked of.

Coming Motor Events

Light Car Race—Light car race at Savannah under Automobile Club of America's auspices, November 25.

Grand Prize Race—Automobile Club of America's grand prize race at Savannah, Ga., November 26.

Paris Salon—Annual French motor car show, November 28-December 18.

French Show—Eleventh annual Paris salon, November 28-December 13.

Palace Show—Ninth international show, conducted by the American Motor Car Manufacturers' Association with the Importers' Automobile Salon and the Motor and Accessory Manufacturers, Grand Central palace, New York, December 31 to January 7.

Garden Show—Ninth annual show of Association of Licensed Automobile Manufacturers, Madison Square garden, New York, January 16-23.

Philadelphia Show—Annual show at Philadelphia, January 23-30.

Cuban Road Race—Cuban Automobile Association's road race, February 1.

Chicago Show—Annual N. A. A. M. show in Chicago, February 6-13.

St. Louis Show—Annual motor car show in St. Louis, February 15-20.

Hartford Show—Hartford Automobile Dealers' Association's annual show at Hartford, Conn., February 27-March 6.

NATIONS DISCUSS THE PROBLEM OF ROADS

Congress in Paris Session Arrives at Several Conclusions Regarding Highways—Next Meeting in 1910

PARIS, Oct. 27—The 2,250 members of the first international road congress have dispersed to their respective twenty-nine countries, leaving behind as a permanent record an international road office established in Paris, a mass of decisions regarding road building and maintenance for motor traffic, and a resolution to meet again in Brussels for the second confabulation during the Belgian exposition of 1910. At this second meeting the delegates will be the guests of the Belgian government. Considerable value is attached by all the members, and especially by the American delegation, to the formation of the permanent association, controlled by an international commission, and having offices in Paris. It is this association, composed of two members per nation, and having as its temporary officers those who administered the present congress, which will be responsible for the second gathering at Brussels, its most important work will be to collect information regarding experiments in road building, to organize and encourage chemical and mechanical experiments with tar and other road-building material, and generally assist in the adaptation of highways to modern conditions of locomotion.

Conclusions voted at the final assembly, after discussion in the sections, are somewhat voluminous, and are not limited in their application. Dealing with the present road the congress found better material should be used, and that greater attention should be paid to foundations. A cement bed, 4 to 6 inches thick, should be laid for all pavings, whether with large or small blocks. There should be a thin layer of sand between the foundation and the blocks. Experiments with tar or bituminous products incorporated into the road-making material were recommended, in order to arrive at some cheap and efficient method of carrying on this work. Paving with small stones having been reported to give excellent results as regards resistance and cheapness, it was recommended that they should be further tested with various kinds of traffic.

Complete resurfacing, in place of partial repairs, was recommended. Also the entire width of the roadway should be resurfaced at one operation wherever possible, the traffic being turned off into side roads while work was in progress. Hard and homogeneous road material only should be used, the binder should be suitable to the road, and moreover reduced to a minimum. Authority to lay water, gas and electric mains under paved roads should only be granted in exceptional cases, and for want of any other practical solution.

Paving and other improved surfaces were recommended as a remedy for wear and tear, as well as to remove the dust nuisance. It was considered that oiling, the use of deliquescent salts, etc., were efficient as a dust remover, but their benefit was not of long duration, and their use could only be recommended for special occasions. Planting of trees along the roadside was recommended with a view to the suppression of dust. The official decision on surface tarring was that when well carried out it was undoubtedly an efficient remedy against dust and that to a certain extent it protected the roads against the destructive action of fast vehicles. Experiments in tar-made roads were not considered to be sufficiently advanced to allow of a decision. Experiments in this direction, however, should be encouraged.

That roads in the future should be well constructed of hard material, resisting, and not slippery, was understood. In addition, the future road should have a single track for all vehicles, with the exception of high class avenues, and in no case should the width be less than 20 feet. Camber should be as low as possible, compatible with efficient drainage. The radii of curves should be as great as possible, and in no case less than 164 feet, while the outside should be banked slightly. Nothing should be allowed which would obstruct the view at curves, intersecting roads should be visible and very wide grade crossings should be avoided, or if this were impossible they should be properly announced both day and night. A narrow footpath on the inside of all curves was highly recommended, with a strict law against dumping road material on it. Though multiple track roads were not recommended, except in special cases, it was believed that cycle tracks and horse paths should be laid on the side of the road wherever there was need for their use. The line of the road should be clearly defined by trees.

The congress being composed in majority of professional road-makers, with motorists poorly represented, there was no attempt to minimize the damage done by mechanical vehicles. Fast vehicles were declared to disintegrate the road by scattering the binder, the damage being in proportion to the speed. Too harsh an application of brakes and rapid acceleration were responsible for injury, while changes of gear did damage, though in a smaller degree. Hardened metal-studded tires were condemned, smooth tires being recommended, or, if really necessary, studs of soft metal. Chains, being unknown to Europe, were not discussed. Heavy commercial vehicles should have smooth rims, except in special cases and on certain roads. Heavy vehicles were declared to cause injury by depression and ruts, and to avoid this the pressure per inch of tire should be as light as possible. A maximum of 825 pounds per square inch of tire, with diameter at present in vogue, was voted for. It was difficult, however, to give an absolute figure, for very broad tires could not exercise a uniform pressure by reason of excessive camber on many roads.

A uniform system of marking distances for the entire country was recommended. Unnecessary matter on sign posts should be eliminated. There should be four road signs only, announcing danger spots on the road, sharp turning, grade crossings and dangerous cross roads.

An average speed of 11 and a maximum speed of 15½ miles an hour were recommended for all large passenger-carrying vehicles, omnibuses, etc. The weight of the driving axle should be reduced to a strict minimum and in no case should exceed 4 tons. Heavy commercial vehicles were given an average speed of 6 and a maximum speed of 9 miles an hour, with an axle weight of 5 tons, the weight per centimeters of width of tire not to exceed 150 kilos, with wheels of existing diameter.

It was the opinion of the congress that light railroads should be laid outside the bed of the road; wherever it was practically possible these lines should be on special tracks, leaving a width of roadway on not less than 16 feet. When trolley car tracks had to be laid in the roadway they should be at the level of the surface, without projections or depressions, and without any change of profile, either transversely or longitudinally. The roadway should be such that a width of at least 8 feet would be provided clear of the portion on which the trolley cars run. The interested parties were recommended to pay special attention to the removal of all obstructions at present caused by trolley cars and light railroads.

Minister of Public Works Barthou looked the facts squarely in the face and recognized that new systems must be adopted for new methods when he decided to call together the international congress uniting representatives of all nations, and experts from all countries. The response was an assembly of 2,500 members, speaking twenty-nine different languages, and officially representing twenty-eight governments. For 10 days the 2,500 men deliberated on the future of the roads, studied the big exhibition collected from all quarters of the globe; they visited and compared every example of experimental road work within 40 miles of Paris, and made copious notes.

It was admitted, as a starting point, that the motor car, more as a result of its speed and its numbers than because of its own special construction, is destroying

the roads. To put it more equitably, the roads, as at present constructed, are unsuitable for heavy and fast mechanical traction. L. W. Page, director of the United States office of public roads, went into this subject in one of the 102 papers presented, declaring that the damage was done by the tractive force or shear exerted by the driving wheels of motor vehicles.

"At high speeds," he declared, "there is a considerable amount of slip, as is proved by connecting both front and rear wheels with separate speedometers. This slip undoubtedly increases the amount of finely divided material of the road surface thrown into the air. The broken stone road surface has little power to resist a shearing stress, consequently the fine material of which it is composed is carried into the air, subjected to the air currents caused by the body of the car, and subsequently to the wind."

Several other delegates who treated the same subject explained that on paved surfaces the effect of rubber tired wheels was practically nil. The case of the Avenue des Champs Elysees, reserved entirely for motor cars, was given as an example of the small amount of damage, the only effect of the rubber tires being to polish the wood blocks smoother. Granite or other hard stone pavement, if laid on a solid foundation, hardly suffered at all from motor traffic. The binder between granite blocks might be sucked out by the action of the pneumatic tires, but this could easily be remedied by the use of more suitable material. Chains and all anti-skid devices came in for criticism as road-destroyers on powerful cars driven at high speeds, one English road builder going to the extent of proposing fine or imprisonment for all who used them. It was quickly pointed out, however, that under a makeshift system it was often necessary to use non-slipping devices, though they might be injurious, which would be unnecessary under scientific methods of road construction.

Robert Phillips, consulting surveyor of the Gloucester county council, was of the opinion that rubber-tired vehicles did not require a very strong road, but they must have a smooth surface, the effect of pneumatic tires jumping from ridge to ridge being to file or grind the upper surface of the metal, suck out the binding material and loosen the road. Below 20 miles an hour there was little damage; above 20 miles an hour the effect was serious. Beyond what was due to speed, little damage was done by either solid rubber or pneumatic tires.

The excessive crown of roads was, in the opinion of M. Moissenet, chief of roads and bridges at Montauban, one of the causes of unnecessarily rapid deterioration. Where the crown was high vehicles were obliged to keep in the middle, with the result that this portion of the road was prematurely worn out. The crown should be 1-50 after resurfacing, and 1-100 before resurfacing. To build any road less than 16 feet in width was false economy.

In order to preserve pavements and roadways Engineer Caldagues, of the Paris roads and bridges department, insisted on the necessity for more and more proscribing the placing of gas, electric and water mains under roadways. When a departure has to be made from this rule, the road department should reserve to itself the care of replacing the roadway against reimbursement on a suitable tariff.

Harder and better material was constantly insisted upon for macadam roadways, in order that they might be able to resist the effect of fast traffic. There should be increased cohesion by longer rolling, by the use of proper binders, and by surfacing with tar. Tar roads, which have been very extensively experimented with in France, were not received with full favor by the congress. It was only after long discussion that a non-commital resolution was passed, in which the conference "recommended paving for a remedy against dust where traffic was heavy and intense." Crude oils and deliquescent salts were a remedy against dust, but were only ephemeral in their results. The congress believed that tar was undoubtedly a remedy against dust, that in a certain measure it protected the roads against the destructive effect of motor cars. Under certain conditions it was to be recommended for broken stone roads where circulation was intense.

France is more interested in the building of tar roads than any other nation, having at the present time 1,400,000 metres of tar roads, compared with 550,000 square metres for England, and 510,000 square metres in Germany. Dr. Guglielminetti, the president of the Anti-Dust League, was of opinion that if tarring could not replace asphalt or paving on roads of very heavy traffic, it gives excellent results on roads of moderate traffic, and especially where motor traffic is very intense. The skin of tar prevents the pneumatic tire from sucking up the binding, and for this reason prevents the grinding down of the roadway. In Paris tar surface has increased from 21,000 metres in 1904 to 360,000 square metres in 1907.

A feature of the different visits to Paris and the immediate suburbs was the opportunity for examining the latest experiments of macadam roads with various kinds of tar sprayed surfaces, and such methods of construction as Tarmac, Pitchmacadam, Aeberli, and others, in which the material to be used is prepared and mixed with tar before being brought to the road under construction. As many of these processes were in an experimental stage, the congress, while recognizing that the suppression of the dust nuisance was doubtless to be found in this direction, did not pronounce definitely in favor of any one system.

Apart from the deliberative gatherings, a very extensive road exhibition attracted much of the attention of the members of the congress and the general public. The exhibition united a vast amount of material connected with the building and maintenance of roads, and several useful comparative exhibits from city councils, road departments, etc. The city of Paris put forth an interesting comparative exhibition of its experiments in the adoption of mechanical for horse traction in the street sweeping and watering department. The first mechanical sweeper and sprinkler was a steamer adopted in 1901, and still doing service. As its weight, however, is nearly 11 tons, its effect on roads is such that it cannot be considered a complete success.

The second mechanical sweeper was operated by a two-cylinder Aster gasoline motor, which gave excellent service and is still in use. Three years ago a larger sweeper and waterer was adopted, the motive power being a two-cylinder de Dion of 15-18 horsepower, driving the vehicle at 8 to 9 miles an hour. Except that the power was found to be rather low, this was considered very satisfactory. It had been decided to take out the two-cylinder motor and substitute a four-cylinder engine of the same make. A Mors watering cart was shown for use on wide avenues where traffic was fast and intense. Its four-cylinder 24-horse-power engine gave a speed of 10 miles an hour, which was sufficiently fast to avoid interfering with traffic, and its sprinklers could cover a width of 70 feet at one watering.

There were one or two cases of the conversion of horse-drawn sweepers to gasoline-driven machines, by the adoption of a front drive device, a two-cylinder gasoline engine transmitting power through longitudinal shafts and universal joints to the front road wheels. The rear portion of the machine was unaltered, the drum being revolved from chains on the road wheels, as in the old horse system. The experiment had been found more economical than the abandoning of the horse material.

Among the American delegates taking part in the congress were: H. H. Gross, Chicago; Samuel C. Lancaster, professor highway engineering, University of Washington, Seattle; Samuel Hill, president Washington Good Roads Association; R. H. Thomson, city engineer, Seattle, Washington; E. L. Powers, publisher Good Roads Magazine, New York; Harold Parker, chairman Massachusetts Highway committee, Boston; Austin B. Fletcher, secretary Massachusetts highway committee, Boston; Chandler Withington, chief engineer, department of finance, New York city; Arthur W. Dean, state engineer, New Hampshire; Nelson P. Lewis, New York; G. L. Clarke, borough of Boston; William S. Hogan, New York.

Hoosiers After Improved Roads

Indianapolis, Ind., Nov. 2—Believing that the present system of road building has not proved satisfactory and that much road material has been wasted, motor car owners are organizing the Indiana Bureau of Good Roads. Temporary headquarters have been established with the Hearsey-Willis Co., and within a short time a convention for permanent organization will be called. A temporary committee has been appointed composed of R. A. Brown, president; George C. Pyle, secretary; F. I. Willis, of the Hearsey-Willis Co., treasurer; J. C. Crabill and W. H. Roberts, the latter a Marion county commissioner. The organization hopes to secure legislation creating an Indiana highway commission, to have charge of all road building in Indiana. A few years ago such a bill was introduced in the legislature but was not given serious consideration. Speaking of the movement, the committee says: "Under the present system millions of dollars have been expended upon public roads in Indiana. A large part of these millions has been thrown away because the system is inherently bad. No matter how good, or how bad, our roads are, they should be very much better. To get needed improvement there must be a campaign of education and agitation. The farmers of Indiana have vital interest in better roads. They are not realizing their own desires for ideal highways. The cities are making rapid strides in building good and permanent streets. The country and city are alike interested in good streets and good roads. Their interests are wholly mutual. Free rural delivery, the motor car, farm traffic and comfort, as well as fair economy demand that roads should be more permanently constructed, more practically repaired and more economically maintained. This cannot be done under the present system. Road building material like Indiana natural gas, has been wasted with a profligacy that is appalling. Thousands and thousands of yards of materials are dumped upon the roads, which because of bad drainage, bad grading and subsequent neglect are of but little practical utility. This waste should be stopped. There are practical and economical methods. Other states have led off and Indiana is behind. In some states road commissions have been created with excellent results."

Lake county, Indiana, has some admirable roads, though, so good in fact that it is desired by the Chicago Automobile Club to run the Jefferson de Mont Thompson stock chassis race over a 20-mile circuit near Crown Point and the town of Lowell.

Motor Car as a Worldwide Factor

By E. P. Chalfant, Assistant General Manager of Association of Licensed Automobile Manufacturers

THE motor car after all is simply a manifestation of the forces of evolution that are working out the world's destiny, and its appearance is no more remarkable than was the advent of discoveries in other lines of endeavor. That there is foundation for the belief, now so prevalent, that the permanency of the car is assured is evident from its world-wide utilization.

There can be no doubt now that the motor car is to play a permanent part in the affairs of mankind. If it had nothing else to recommend it but its time-saving and health-giving attributes, it would be a permanent institution. But it is as a vehicle of commerce that it is to figure more prominently in the future. Its commercial phases are practically unlimited. What the world wants are labor-saving devices, and the motor is one. Manufacturing plants are hauling their product with motor cars in lieu of horses. They find the innovation an economical one from every standpoint.

Then again the motor car is to become a part of every well-regulated municipality. In many of the large cities of the country today motor cars are utilized with great success in the health and fire branches of the public service. They are found to be invaluable to hospitals, where a minute's delay sometimes means loss of life. The same can be said of the fire department, in which branch of the municipal government they have served to advantage. The federal government, too, has become converted to their utility, and has installed motor cars in the postoffice service of the principal cities.

But it is not alone in the large cities that the labor and time-saving properties of the motor car are appreciated. In the isolated sections, far from the beaten paths, the miner and farmer have endorsed the horseless vehicle by using it. This apparent popularity of the car, however, is not confined to one section or nation. It is world-wide in its scope.

In Japan and China motor cars are used in large numbers. In China, especially, it is a familiar sight to see a speeder darting in and out of the traffic. In some sections of the great walled empire, with its centuries of tradition, a motor car is still an object of curiosity and wonder. The roads in Japan are narrow and heavy, and there is room for improvement. In this country Ohio and Iowa possess the poorest roads. In certain seasons of the year the highways of the latter state are well-nigh impassable, the black loam apparently having no bottom. But there is nothing unusual about this, as America, on the whole, is famous for hard road conditions.

In Turkey the roads are rough, but they are made so by the mountainous formation of the country. Turkey, it might be stated, was the last nation in the world to admit the motor car. In fact, it was only during the last 6 months that the prejudice of the sultan was overcome and the empire opened to horseless vehicles.

In the Asiatic countries the motor car has taken hold. In Siam, India and the Straits settlements the industry has done an enormous business. In the last year members of the A. L. A. M. have doubled their regular annual shipment to Siam. The king is a great believer in the motor car, and during his recent visit to Europe rode continuously in one. New Zealand, said to be the best governed country in the world, also has taken kindly to motoring, as it did to the bicycle in the palmy days of that industry.

The Central and South American countries are strong supporters of the industry. In Ecuador and Peru the motor car has performed wonders in strengthening the lines of communication between coast towns and the interior. At Punta Arenas, the southernmost point of habitation on the western hemisphere, the honk, honk of the horn is a familiar sound.

While the motor car seemingly has made its presence felt in all sections of the earth, it must not be imagined for a moment that its rise to a position of security was along a path of roses. From the first its arrival was the butt of prejudice and doubt. No invention of modern times probably has had a more bitterly opposed antagonism to overcome, and, strange to relate, it showed itself strongest in the southern states of the United States. There was more prejudice in the south than was afterward encountered in the Orient. For instance, in Mississippi a law was passed by a local council regulating the speed of cars of 25 miles an hour, and after it was placed on the books a man walked ahead of the car waving a red flag—a most outrageous parody on justice. In Oklahoma a citizen was about to buy a car for delivering groceries when prejudice interfered in the form of a man who said that he would shoot the first person that purchased a machine, and the contemplated buyer cancelled his order. The industry was not, however, to be destroyed by the prejudice of men, but has swept on with resistless momentum, leaping in a comparatively short period to a formidable position among the world's great industries.

The United States annually produces something like 80,000 motor cars, while Italy manufactures 25,000 and France 40,000. Germany is another producing nation, as is England, but the two first mentioned build the bulk of the foreign output.

Statistical Status of the Motor Car

By Alfred Reeves, General Manager American Motor Car Manufacturers' Association.

IT wasn't so very many years ago when the joke was proverbial that the motorist spent half of his time in the car and half under it. I well remember returning from a 50-mile trip in the early days and being met with incredulous smiles when we claimed to have made the trip without an adjustment of any sort. Now we have 4,000-mile trips with sealed bonnets.

Some learned gentleman once remarked that there were three kinds of lies: The ordinary untruth; fish and motoring stories, and statistics. Nevertheless, the statistics of the last 10 years are our main guidance for the future of this great industry. Many of the early figures are lacking, but it is safe to say that the motor car sales in 1903 were considerably less than $8,000,000, which has increased to over $105,000,000 in 1907, while this year's figures when compiled will show almost if not about the same, despite the recent financial depression. During 1907 something like 52,000 cars were made and sold and this year will supply about the same figures, although many of them are of the small type. It is worth noting that the motor business has suffered in volume less during the last 12 months than any other line, although the increase was on the side of the cars selling for $1,500 or less.

It is estimated that the present capital of the motor car business is about $94,000,000, with an additional $36,000,000 in kindred trades and $57,000,000 more in garages and retail salesrooms, making a total of $187,000,000. According to latest figures obtainable, there are 58,000 employes in the motor car factories in this country, about 29,000 employed indirectly in making the parts, while there are 21,500 in the sales and garage establishments. This gives a total of more than 108,000 employes. The records show that there are in this country 253 builders of motor cars, of which at least 125 are beyond the experimental stage and are placing practical cars on the market. There are not fewer than 500 different trades involved in motor car manufacture, running from leather, varnish, broadcloth and buttons to steel, brass and rubber. Although the importation of motor cars is fast decreasing, it is a fact that some $28,000,000 worth of foreign cars have been sold here. The trend is now going the other way, and the export trade of the American maker is increasing rapidly.

With 52,000 cars as a conservative estimate for this year, it is safe to say that 175,000 motor cars have been sold here during the last 8 years. During the last year 13,980 cars have been registered in New York state alone, making a total registration in the state since the law went into effect of 63,338 cars. Above all and of great interest to those about to enter the trade is the fact that 9,386 new chauffeurs were registered during the current year. One cannot be a pessimist on the car's future in the face of such figures.

Factory reports indicate a tremendous production in motor cars for next year that ranges from $150 for the school boy to $11,000 cars for the luxury-loving millionaires. Four factories alone announce a total production of 36,000 cars, two of the leaders planning to turn out 12,000 cars each. Yet there is no reason to believe that next year will see an overproduction, provided good cars are made and sold at reasonable prices. The tremendous buying power of this country is evidenced in a score of ways and particularly by the absorbing of motor cars during the last 2 years.

Possibly next year's production will reach 75,000 cars. Yet we well know for the last 5 or 6 years a million buggies a year have been made and sold by the carriage people. Just what becomes of them no one has been able to say, but the manufacturers continue to turn out these great quantities of horse-drawn vehicles. They are now turning their attention to motor vehicles, for the farmer is demanding the more modern type, for which he is quite willing to pay the price. One of the largest makers of agricultural machinery plans to make 20,000 cars next year, yet this will hardly give the company one apiece for its agents throughout the world.

Taxicabs are fast coming into use and there is no city of any prominence throughout the country which will not have occasion to use them. Americans are a cab-riding people, but their small use of cabs before the introduction of the taxi was because of their disinclination to become involved in a fight. Hiring a cab to this time always required a fight either over the charge before the beginning of the ride or a fight on the overcharge after it. Last year in Paris I was told that some 3,500 motor cabs were in use, which now has increased to about 5,000. There are 1,500 cabs in London and the number is constantly increasing. The foreign cities will use more cabs owing to their poor transportation methods in other lines.

Last, but not least, we have the unlimited field of the commercial vehicle. We can say that the future will see the horse relegated to a life of leisure that he has well earned, while his work is performed by mechanically-driven motors. As there will be no horses to take up room and as the motor cars will carry twice the load and travel at twice the speed, it will be like widening the streets threefold, while the improved sanitary conditions admit of no argument.

Prosperity Talk in the Northwest

Minneapolis, Minn., Nov. 1—Nothing is heard in Minneapolis and the northwest but the strongest kind of prosperity talk and all the dealers are enthusiastic about the prospects for a banner year in the industry. The reason for this seems to be the general good times prevailing, the abundance of money for investment and the readiness of many people heretofore not in the market, to listen to the arguments of the agents for the different lines of the motor industry.

Eastern manufacturers who have neglected the northwest or who have given it but passing attention—possibly because it looks so far away to them—are beginning to wake up to the fact that they are passing up a golden opportunity. A look at the map—a cursory glance at conditions—should be enough to enthuse any manufacturer. First of all, the territory contains the natural resources—the money for investment. Secondly, the state is not honeycombed with electric railways. Thirdly, there is a vast interest in motoring, encouraged by the newspapers, and lastly, the motor car here in the northwest is held in high regard as an everyday convenience.

Cars are beginning to make their appearance on the Minneapolis produce market, machines being used several times a week by farmers within a radius of 20 miles of the city, to transport their garden truck. Here in itself is a vast field and one where results would surely come to active cultivation and work.

Several new agencies have been contracted for within the past few days by cars not heretofore represented here. Vic Stromquist, for many years identified with the Joy agency, handling the Packard, has gone into business, being temporarily located on South Sixth street until his permanent quarters on Hennepin avenue are completed. He will handle the Corbin. Kemp Brothers, on Hennepin avenue, have closed for the Brush. It is expected that they will take on another line of higher priced cars soon, negotiations being under way. Harvey E. Haynes, brother of Mayor Haynes, who has the Welch, has signed up with the Pennsylvania people and is now looking for a permanent location in the vicinity of the row. The Fawkes Auto Co., handling the Rambler and Overland, has taken on the American.

One of the strongest evidences of the northwestern prosperity is the announcement that the Pence Auto Co., handling the Buick and Stevens-Duryea line, has ordered 1,800 Buicks to be sold in the northwest in the next year.

The Readers' Clearing House

EDITOR'S NOTE—In this department Motor Age answers free of charge questions regarding motor problems and invites a discussion of pertinent subjects. Correspondence is solicited from subscribers and others.

WANTS ALL BRASS SHIELD

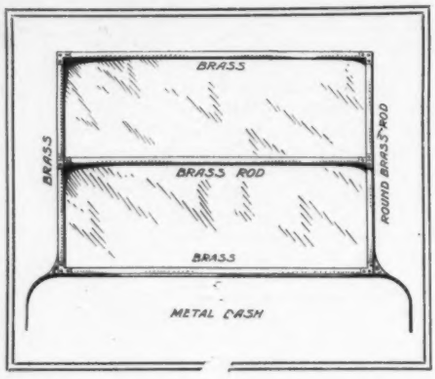
RICHIBUCTO, N. B.—Editor Motor Age—Will Motor Age give me the names of the makers of engine-driven air pumps for motor car tires, also the names of makers of folding wind shields having a brass frame and fitting close to the dash. —H. O'L.

The following concerns manufacture engine-driven tire pumps: Auto Pump Co., Springville, N. Y.; Comptoir D'Innovations Pour Automobiles, 1693 Broadway, N. Y.; Eberman Auto Appliance Co., 1205 Monadnock block, Chicago, Ill.; Herz & Co., 203 Lafayette street, New York, N. Y.; Pacific Tucking & Mfg. Co., 471 Eighteenth street, Brooklyn, N. Y.; Rohrbacker Automatic Air Pump Co., 1231 Michigan avenue, Chicago, Ill.; Rotary Triplex Pump Co., 126 So. Jefferson street, Chicago, Ill.; Tiley-Pratt Co., Essex, Conn.; Whitmer & Rung, 200 Girard Trust building, Philadelphia, Pa.; Wray Pump & Register Co., Rochester, N. Y.

Wind shields with brass frames are manufactured by upwards of half the wind shield makers in the country. A few of these are: Banker Bros. Co., Pittsburg; Adept Machinery Co., Chicago, Ill.; Nonpareil Brass Co., Providence, R. I.; Studebaker Bros. Mfg. Co., Chicago, Ill.; Troy Carriage Sun Shade Co., Troy, O., and Conover Wind Shield Co., Paterson, N. J. Although all of these concerns do not have regular listed wind shields fitting as close to the dash as your sketch suggests it is certain they would furnish such on a special order.

COIL USES TOO MUCH CURRENT

Nashville, Tenn.—Editor Motor Age—Will Motor Age inform me how to remedy the trouble I am having with a four-unit Splitdorf coil? I have been using this coil about 12 months and the platinum points, both on the spring and on the contact, pit up every few days, and sometimes within a few hours, making either a very poor contact or destroying the contact entirely. I have tried new dry cells, recharging the storage battery and new platinum points without result. All of the wiring, including the ground wires, appear to be properly connected and in good condition. The spark plugs are also comparatively new and clean and in good shape. At how many ampere should each unit be set in order to obtain the best results?—Howell E. Jackson.



BRASS WINDSHIELD DESIGN

You are using too much current in your coil. One ampere should be sufficient for the best results. So long as you keep using this amount of current, just so long will you burn the platinum points off the spring and contacts.

MOTOR PUMPS CISTERN WATER

Navarre, O.—Editor Motor Age: I have built an annex to my residence, for my motor car in winter, which is heated from the hot-water heating plant. The car stands right over the cistern, the pump being to the front, which is arranged to pump water into tank 30 feet above by hand. Will Motor Age tell me how I can do this water pumping by motor power? I will need some gearing for the pump, or, if I had a centrifugal pump, could run it with a belt from crankshaft by first fixing a pulley to it. Where can I purchase such a pump? Or, how can I arrange gearing for the present pump?—P. M. Zinsmaster.

The best method of getting the water from the cistern to the tank would be by the employment of a gear pump which could be belt-driven from the flywheel of the motor. Such a pump could be secured from any of the regular pump manufacturers. Below is given a list showing some of them: McCord & Co., Chicago, Ill.; Lipman Mfg. Co., Beloit, Wis.; Lobee Pump and Machinery Co., Buffalo, N. Y.; New York Gear Works, Brooklyn, N. Y.; Imperial Brass Mfg. Co., Chicago, Ill.; Bryne-Kingston Co., Kokomo, Ind.; Brown & Sharp Mfg. Co., Providence, R. I.; Brennen Motor Co., Syracuse, N. Y.; Garver Machine Co., New York, N. Y. It would not be satisfactory to use a rotary or centrifugal pump for this work, but a small reciprocating pump could be used equally as the gear pump mentioned. It would be possible in case of a reciprocating pump to attach the free end of the connecting rod to a large pulley, which pulley could be made to contact with the surface of the flywheel, this affording a particularly simple method of driving.

WANTS FACTORY EXPERIENCE

Platteville, Wis.—Editor Motor Age—I am very much interested in factories, garages and agencies. Will Motor Age give me some information along these lines? What are the duties of motor detailer at the factory?—W. G. Jarrett.

The best method of obtaining information on garage and factory work is a short apprenticeship in either. It depends largely on the nature of the information you want: Do you want information on manufacturing processes or on superintendence of departments? If it is on the handling of lathes, drills, grinders, the only way this can be obtained is by working in the factory. Garage work covers general management, and the repair department: the first calls for good executive ability, the latter for a thorough knowledge of car construction coupled with ability as a good mechanic. Motor Age does not know what is meant by "detailer" in the connection stated.

HAS COIL TROUBLE

Primghar, Iowa.—Editor Motor Age—The righthand unit of my two-cylinder Splitdorf coil has always given me more or less trouble. I took it apart some time ago, and found that one of the wires had become loosened from the screw, and that while the machine was standing still the wire would come in contact with the screw; when on the road it would miss, as the vibration would separate the parts. After repairing this it seemed to be all right, but now it is bothering again. The wires are or seem all right and the vibrator, when it acts, sings nice and clear, but when it is buzzing its best it will suddenly stop and then in a short time it will start up again. The vibrator does not stick to the contact screw, as it seems loose; and if this were the trouble I could tell it by placing my finger on the spring. I can press the spring down, release it and work with it and it will not buzz, and then shortly it will start up again. Start up the engine on the floor, and it seems to fire all right on the slow speed; but advance the spark, and then it will miss somewhat. Go out on the road, and it will

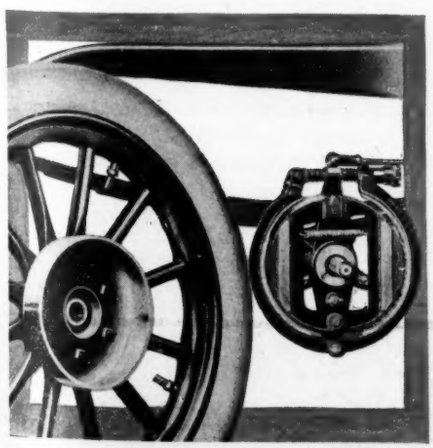
fire but a few times on that cylinder. The wiring is all right, as far as I can see, and the batteries and their wiring are all right, as the other coil works perfectly. It must be in the coil; or, if not, where is the trouble, and what shall I do to overcome it?—Joseph Reynoldson.

The trouble with your coil will be found in the primary winding, in which without doubt there is a break in the wire. This break explains the sudden stopping and starting up again, the stopping occurring when the ends of the wires for some unknown reason become separated. It frequently happens that where a break occurs in the primary winding that the motor works all right on low speeds, and with a slight load, but as soon as a heavy load is put on the trouble increases. This is due to electrical conditions within the coil which appear prominently under load conditions. The only way of overcoming this will be to have a new winding, which practically means a new unit in the coil. Cases are on record where a unit which has given trouble of this nature, after being closely inspected, has been found to have the primary winding broken in as many as six places and yet the coil worked and gave reasonable service. There are many causes which give rise to the breaking of the wires. In some cases it is due to too tight winding, in others to a straightened kink in the wire, and in other cases to causes foreign to the winding.

USES GLASS INSULATION

La Crosse, Wis.—Editor Motor Age—Through the Readers' Clearing House will Motor Age inform me if there is any make of spare plug using a substitute for porcelain or mica, and the comparative merits of the various kinds? Is there any spark plug made that dispenses with the use of coil and high-tension wiring?—A subscriber.

Motor Age cannot give the name and address of a manufacturer of a spark plug in which glass is used for insulating instead of mica or porcelain, although one of this type was exhibited at the Chicago show 2 years ago. The usual insulation is mica and porcelain. The Bosch magnetic plug dispenses with the use of a spark coil, as well as high-tension wires. This plug was minutely described in Motor Age issue of July 2, page 30.



MAXWELL BRAKE, TYPE USED IN TEST

LIGHTING REPAIR ROOM

George, Ia.—Editor Motor Age—As our repair room is not accessible to a regular electric light plant and we do not like to use open lights, will Motor Age, through the Readers' Clearing House, suggest some way to construct a strong home-made battery which could be used for several small electric bulbs. Would several wet batteries give enough current for such a proposition? How large should they be, what proportion of ingredients should be used, what strength would they develop, and how often should they be replenished?—A subscriber.

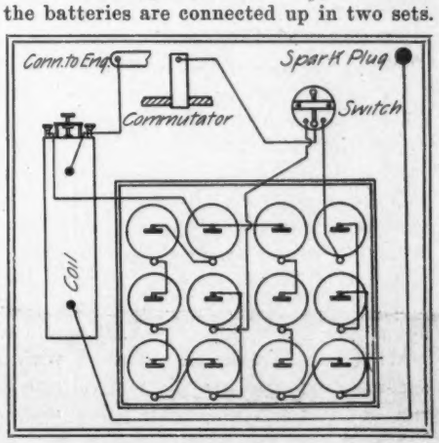
The most satisfactory method of lighting your repair room will be installing a small electric generator, which can be secured from any of the concerns, such as General Electric and Westinghouse. For small incandescent lamps a 110-volt circuit is necessary, and each lamp consumes approximately one-half ampere. The difficulty with using many wet batteries is that they have not the 110 volts necessary, a forty-cell vehicle battery only giving 80 volts, or at the rate of 2 volts per cell. A good solution would be to use coal oil lamps.

MAXWELL BRAKE TESTS

Tarrytown, N. Y.—Editor Motor Age—Motor Age readers will doubtless be interested in brake tests conducted by me. These tests were held near the factory on Wednesday morning, September 23. A smooth stretch of macadam road was selected, with plenty of room for getting up speed, and a four-cylinder Maxwell with a passenger capacity of five persons chosen, equipped with a standard Maxwell double-external-contracting rear hub brake. With passengers the car weighed about 2,850 pounds. The first trial was made with the brakes lined with the new asbestos preparation used in the Maxwell cars and with the tonneau empty. The machine was speeded up to 30 miles an hour, and when the road mark crossed the driver's line of vision with the radiator, the brake was applied in full strength. The wheels immediately locked and the car came to a dead stop in 74 feet 10 inches, the distance measured from the line to the rear axles. Again it was tried. This time with the tonneau occupied the wheels again locked immediately and the car came to a dead stop 61 feet 6 inches from the line. This proved to the satisfaction of all that the new asbestos preparation is the desideratum for a brake lining. When the brake was thrown the wheels locked immediately and silently, there was no loss of time, undesirable noise, or slippage. The other materials for brake lining were found to lack several of the most desirable characteristics of the asbestos lining. It was found that when cast iron blocks were used the car traveled about 25 feet before the wheels locked, that during that time the friction gave rise to a disagreeable scraping noise, and that due to the delay in the locking of the wheels the car traveled a considerable distance beyond the 61 feet of the asbestos. Hickory blocks were tried, but they too give rise to the same disagreeable noise, it was found they burned easily and that the car covered approximately 17 feet before the wheels locked. Hickory blocks boiled in paraffine showed improvement in the matter of noise and seemed to grip without the jerking experienced with the other two; they were found too to be more immune from combustion than the dry hickory — but they failed to lock the wheels until the car had traveled a little over 20 feet. Red fiber, a papier mache product, was found to be better yet in the matter of noise, combustion and slippage, but the 12 feet found necessary to ensure locking the wheels debarred it when measured according to the standard of the asbestos. Camel's hair was found most admirable: it was noiseless, it did not jerk, its life was long. But it too required about 12 feet in which to lock the wheels. Cork too was tried. With the exception of the asbestos it was the most desirable; its life is long, it was noiseless, it gripped nearly instantly, but the gripping was accompanied by a severe jerking. The judges therefore ranked the different materials in the following order for general efficiency: Asbestos, cork, red fiber—camel's hair, hickory blocks boiled in oil, hickory blocks dry, cast iron.—J. D. Maxwell.

USING SIX DRY CELLS

Fort Worth, Tex.—Editor Motor Age—I have a single-cylinder Olds, in which the batteries are connected up in two sets.



WIRING FOR SIX DRY CELLS

Will Motor Age, on the accompanying diagram, show me how by wiring batteries I can use six cells instead of four. I have had considerable trouble with the spark and changed from a Splitdorf to a Pfanstiehl coil; but, I understand that, in order to get the full benefit of the power of the spark, the battery should be connected to a series of six cells.—Henry W. Miller.

There is no necessity for using more than four dry cells in a set, providing the dry cells are all right, as four dry cells should give 6 volts, which is sufficient for the ordinary coil. Should, however, you desire to use six cells in a set, the wiring is as per the accompanying diagram.

TREAD INFORMATION WANTED

Chicago—Editor Motor Age—Customers of mine in Louisiana have written me for the names of manufacturers who make cars with 60-inch treads, which are necessities in the region from which come my letters. Can Motor Age furnish me with the names of concerns which manufacture cars with this unusual tread?—H. F. Vrooman.

Motor Age knows of no manufacturer turning out cars with 60-inch treads, although it has heard of several cases where cars have been specially built in order to get this extra 4 inches. If any of the Motor Age readers can furnish Mr. Vrooman this information it will be forwarded to him.

BLACK ENAMEL FOR LAMPS

Paulsboro, N. J.—Editor Motor Age—Will Motor Age, through the Readers' Clearing House, inform me where I can obtain black enameled lamps, which will burn Prest-O-Lite gas without destroying the enamel, and of a size suitable for 1 or 2 horse-drawn vehicles?—John L. Miller.

Black enamel lamps of this variety can be obtained from any lamp manufacturer by simply requesting that the enameling be done in this manner, instead of the regular color. The majority of dealers in large cities have arrangements whereby this black enameling or black nickeling is done by local concerns, and the cost varies from $1.50 to $2 per lamp. It takes a couple of days to have this work done.

DRY CELL TESTING

Dowagiac, Mich.—Editor Motor Age—I have noticed the statement printed that two accumulators could not be wired together and used as one when their voltage runs down as is done with dry cells. Is this true, and if so will you kindly state through "Readers' Clearing House" the reasons? Also why is a battery of dry cells tested by the amperage of each cell and a storage battery tested by the voltage of the entire battery?—A. B. Gardner.

What you have heard regarding wiring accumulators together when a voltage is run down is not so. The point arises, What is the use of wiring together in series two batteries whose voltages are,

say, three each, because if wired together the total voltage would still be three, and no advantage would be gained. A dry cell is tested for its amperage because it frequently happens that such a cell with very slight amperage will show 1½ volts, which is the voltage of a new dry cell. If, in this case, the voltage was tested, the person making the test might properly conclude that the cell was in good shape; whereas, its voltage might be reduced to a minimum. The voltage of a storage cell is the criterion, because in a cell of given capacity, if the voltage remains, the amperage is certain to be delivered.

MOST ECONOMICAL SPEED

South Bend, Ind.—Editor Motor Age—Will Motor Age tell me about what speed can the average motor car be run most economically as regards gasoline? We have had an argument here, lasting for 3 days, on whether a car traveling at the rate of 30 miles an hour used more gasoline than the same car, over the same roads, going at a rate of 15 miles an hour.—W. A. Sibley.

The information gained from a great many economy tests conducted throughout the country shows that the most economical pace over ordinary roads is from 20 to 25 miles per hour. These tests have proven conclusively that where a car travels as low as 15 miles an hour the consumption is greater per mile than where the speed is 25 miles. We have no data as to the consumption of 30 miles per hour, but under certain conditions it might not be much in excess of 25. On a windy day the consumption of 30 miles per hour would be in excess of that of 25.

CALCULATING HORSEPOWER

Washington, D. C.—Editor Motor Age—Through the Readers' Clearing House will Motor Age inform me which motor will give the most power, a four-cylinder with a 4¼-inch bore and 4½-inch stroke, 900 revolutions per minute, or a four-cylinder motor with 4-inch bore and 5⅛-inch, 900 revolutions per minute; both having the same pressure. Will Motor Age also give its method of determining the horsepower?—Subscriber.

It is impossible to state which of these would be the more efficient, this being a matter of design, but with equal design each, the one with the 5⅛-inch stroke should be considerably more powerful. With this lengthening of stroke there would have to be, of course, the proper valve diameter and lift, which would be a considerable factor in determining the amount of power the motor would give. The Prince Henry tour held in Germany during the past season, the voiturette race in France, the grand prize race in France, and the 4-inch race on the Isle of Man, have all proven how easy it is to increase the power by lengthening the stroke and reducing the cylinder diameter. According to A. L. A. M. formula a 4¼-inch motor should give 28.9-horsepower; whereas, the 4-inch size would give 25.6-horsepower. This formula does not take into consideration the length of stroke. Where more definite horsepower rating is necessary, a formula of the following nature may be used:

$$\text{H. P.} = \frac{1 \times \pi D^2 \times N}{7.5 \times 400 \times 10 \times 60}$$

in which D is the diameter of cylinders in centimeters; L, the length of stroke in centimeters, and N, the number of revolutions of crankshaft per minute. $\pi = 3.1415$. According to this, the horsepower of the 4¼-inch size would be 30-horse, and that of the 4-inch by 5⅛ would be approximately 28. A simple horsepower formula is

$$\text{HP} = \frac{18{,}000}{D^2 LR}$$

in which D is the diameter in inches; L, the length of the stroke in inches, and R, the revolutions per minute. According to this formula the horsepower of your four-cylinder motor would be 16.4 horsepower for the 4-inch bore and 16.2 for the one with the 4¼-inch bore.

VALUE OF MAGNETO

Cherryvale, Kan.—Editor Motor Age—Will Motor Age tell me what is the practical advantage of a magneto over a generator, if any, and which would it advise a person to buy? I would also like the address of parties who have motored from Kansas City to Chicago, thence to New York, or from Kansas City to St. Louis, thence to New York. Does Motor Age furnish route maps of such a trip, and how about licenses for a trip of this nature?—W. A. Curtis.

The advantage of the magneto over a generator is that with the high-tension magneto you have combined in the instrument your make-and-break for the primary circuit, your coil, and your distributer, so that the timer, or distributer on the engine, is eliminated. With a magneto outfit of this type the problem of vibrator adjustments on a multi-unit coil is obviated, the wiring is immensely reduced and the ignition system in general simplified. A generator can advantageously be used in substitution for dry cells or a storage battery, but its use means a continuation of the four-unit coil, the commutator on the engine, and the general wiring scheme. We are not able to give the address of parties who have motored from Kansas City to Chicago and thence to New York. Motor Age can furnish route descriptions of trip from Chicago to New York in book form giving directions each way.

Motor Car Shop Kinks

Aids for the Amateur

STARTING IN COLD WEATHER

A HANDY kink for starting in cold weather, which is less known than it deserves to be, is to warm the cylinders by squirting gasoline into them and firing it with a match at the compression cocks. A few drops of gasoline in each cylinder is all that is necessary, and the match is held to each open compression cock in turn. The resulting small explosion imparts just enough heat to the walls so that, after the crank has been turned twice to expel the burnt gases, fresh injections of gasoline will evaporate and ignite at once on turning the crank. Obviously, before resorting to this device, one should make sure that there is no stray gasoline vapor about, such as might be due to excessive and fruitless priming of the carbureter.

ATTACHING COIL TO DASH

When a heavy spark coil is to be attached to a metal dash, especially an aluminum dash, it is necessary to distribute the weight of the coil over as large an area as possible. If the coil were simply bolted through the dash by four bolts these bolts probably would work loose in the aluminum in time and enlarge the holes through which they passed. In addition, the over-hanging weight of the coil would tend to bulge the aluminum around the nuts belonging to the upper bolts. To make a stiff and durable job, the bolts should go through vertical strips of hard wood not less than ¼ inch thick and 1½ inches wide. These strips should go on the front of the dash and serve to distribute the pressure of the nuts and washers over a considerable area of metal. It may be necessary to have the same strips extend above and below the coil and have additional bolts put through their ends. In that case, leather washers should be used in addition to the metal washers under the heads of the bolts.

GREASE FOR CIRCULATING PUMP

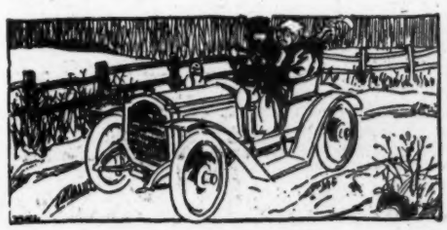
The proper lubricant for the bearings of the water circulating pump is a stiff mineral grease similar to vaseline. Grease containing animal fats softens considerably under heat, and is melted by the water and carried through the circulating system. Mineral grease, on the other hand, retains its consistency up to fairly high temperatures.

INDUCTION IN SPARK PLUG CABLES

Irregular firing, which persists in spite of the utmost care in insulating the circuit and making perfect connections, is sometimes traceable to mutual induction between the spark plug cables, when the latter are several feet long and run side by side close together. The sparks from such induced currents may be as much as ⅛-inch long, and when the mixture is just right it may be ignited by such a spark near the end of the suction stroke. Misfiring of this nature is infinitely more puzzling and demoralizing than that due to simple failure of the spark. It does not always occur when the plug cables run parallel, but appears to be more marked with battery than with magneto ignition, though this statement may need to be qualified. It is also more marked with certain mixtures than others. The remedy is simply to run the cables at least an inch apart. In this connection it may be remarked that when the current supply is small trouble may be experienced with long cables owing to their static electrical capacity, by virtue of which they must first be electrically charged before they will deliver a spark at the plug. A cable may be so large and long as to absorb the whole charge and deliver no spark at all. A third possible source of loss in efficiency is unnecessarily large or sharp pointed metal objects in the high tension circuit, such for example as large binding posts, wing nuts and stray ends of wire. A high tension charge tends to escape into the air from any sharp metal point in its circuit, and objects such as binding posts absorb the charge on their surface exactly as a long cable does.

CARBURETER FLOODING

A possible, but seldom thought of, cause of carbureter flooding is the float striking the top of the float chamber before the float valve closes. This might happen from defective design, from a drop of solder added to the top of the float to raise the gasoline level, or from some accidental cause such as wear of the float valve needle. If the float valve levers reach the limit of their movement before the float valve closes the same effect will be produced. The only sure test for this is to expose the top of the float or the float needle and feel of the needle to see whether or not it is seated. If it appears to be seated, feel of the float and the float levers to see if they have a little further movement. If they have not take the carbureter off and find the interference and correct it. In correcting this interference it may be necessary to take many of the carbureter parts apart and give the apparatus a complete overhauling. A bad tip on the float valve will cause much trouble and can only be corrected by careful guiding.



FEEDING GREASE TO BEARINGS

The theory of the behavior of mineral grease when used as a bearing lubricant is essentially different from that of animal grease. The latter is applied under more or less pressure, but much reliance is placed on the fact that it softens under heat, and indeed runs like oil if the bearing is hot. Mineral grease, on the other hand, does not soften materially under like conditions, and therefore it must be fed to the bearing by steady pressure; preferably by a spring grease cup. As there is obviously a limit to the distance the grease cup will transmit its pressure along the shaft, it follows that the shaft should not extend more than 3 or 4 inches either way from the grease cup, unless it receives an additional supply of lubricant from another grease cup, or from oil, as is the case with some gear shaft bearings. Whether a bearing be lubricated by grease or oil there should be opportunity at each end of the bearing for "stale" lubricant to escape. The same principle applies to a long shaft bearing fed with grease from cups located some inches apart. In other words, an outlet should be provided for the grease midway between the two cups as well as at the ends of the bearing.

STARTING IN SNOW

Certain materials, such as snow or soft earth, sink under the wheels when the car stands for some time, and it is difficult to climb the minute but steep gradient thus created. A steam car can very easily be extricated from such a position simply by see-sawing it back and forth, going a little further each time until the "grade" has been so eased off that it is easily surmounted. This trick is simple with a steam car because the throttle can be left open and the reversing lever rocked back and forth. With dexterity, however, a gasoline car having planetary drive, and suitable arrangement of control levers, could be manipulated in much the same way; and with a very easy gear change and gentle clutch it might even be possible with standard sliding gear transmission.

END PLAY IN STEERING GEARS

A set screw is useless to take the end thrust of the steering worm or the worm gear, and it concentrates the pressure too much. In many steering gears, slackness due to wear is found to a much greater extent in the end play of the worm and segment than in the worm teeth themselves. The only way to make a durable job in taking up end play is to use hard steel washers or disks as large as possible, and provide passages for oil or grease to work across their surfaces. If it were not for the difficulty of cutting it to shape, the blade of an old saw would make excellent thrust washers for this purpose.

W. H. Fahrney's Garage, Built on Shore of Lake

Garage of J. M. Baker, that Cost $3,800

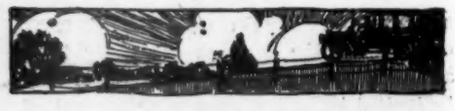
Practical Door Used by H. H. Boore

CHICAGO'S FINE

As motoring gains a firmer hold on Chicagoans the interest in private garages grows apace and at the present time there is great activity in the building line among the owners of the larger-sized cars. With the little fellows the old horse barns offer cheap quarters for the storage of machines, but in the case of an owner with room on the back of his lot it is a matter of pride for him to have something fine in the way of a garage. An example of this is found along Sheridan drive on the north side, the swell residence district of Chicago. One particularly fine stretch of this thoroughfare is in Edgewater and runs alongside of the lake for a couple of miles. Here is a nest of garages built for private owners. A typical one is found at 2790 Sheridan drive, where W. H. Fahrney resides. Mr. Fahrney is one of the oldest motorists in Chicago, having owned more than a dozen different makes of cars in his time. His garage was built according to his own ideas and was constructed 2 years ago at a cost of about $4,000. It is a particularly ornate building, backing up to the shore of the lake, which is a small bluff at this point. The proximity of the lake has been utilized by Mr. Fahrney, who owns a large house boat. He has constructed a tiny slip back of his garage in which he keeps this boat. Two or three times a year he runs his motor car onto the house boat and goes for lengthy cruises around the lakes, taking his car with him and using it when he touches at a port.

That Mr. Fahrney has profited by his experiences is shown by the manner in which the garage is equipped. As the building stands its value is about $5,000, the owner having spent an extra $1,000 in fitting it up. In one corner he has a forge, which is something unique in the way of garage equipment, while in addition he has a work bench. This and the forge cost $100, while $300 more was spent for a turntable and $300 for the heating system. Hot water heat is used and there is room in the garage for three cars. Another feature is a pit with stairs leading into it, while an electric motor furnishes compressed air for filling tires. The building is 44 by 27 feet and upstairs are located the living rooms for the chauffeur, there being four rooms and a bath.

One of Mr. Fahrney's neighbors is F. F. Bullen, at 2754 Sheridan drive, who has a 24 by 40-foot building, with a cozy flat upstairs for the chauffeur. In addition to a gasoline car Mr. Bullen maintains an electric and he has facilities in the garage for charging the electric from his own dynamo. At the same time he can charge batteries used on his gasoline cars.

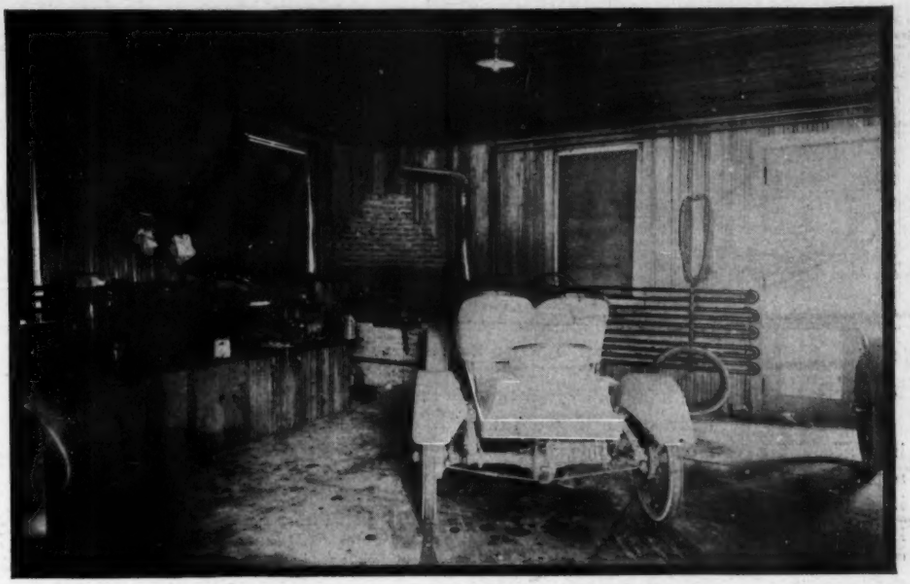


PRIVATE GARAGES

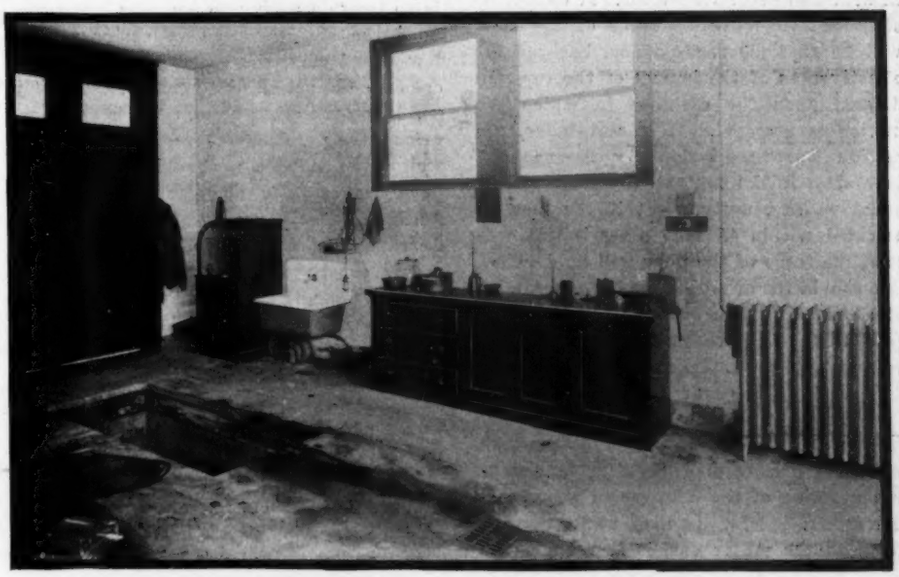
On Kenmore avenue there are more private garages, one of the new ones being that of E. M. Higgins, which has just been completed. All the latest refinements are found here, the floor being of cement, with a cement turntable, electric lights, work bench, Bowser gasoline system, boiler room and clothes closet on the first floor, while upstairs are the sleeping apartments. The garage is located across the alley from the Higgins residence and fronts on a side street. There is a small front yard surrounded by a wire fence and the doorway through which the cars are driven into the garage is placed diagonally across one end of the building so it is possible to drive directly in from the alley without turning half a dozen times.

The unique feature of the garage of H. H. Boore, at 4804 Vincennes avenue, which is in the southern section of the city, is the entrance. The building is located in the alley two doors from the corner, an awkward place if it was necessary to drive into the building in the usual manner, with the door in the center. In order to obviate a lot of seesawing and reversing Mr. Boore placed his entrance diagonally across the corner nearest the street, much as has Mr. Higgins. With the door in this position it is possible to drive directly in from the street without having to back or maneuver for position. The Boore garage cost $4,000, and is a two-story structure made of fire brick and with cement floors. The ceiling is made of 6 by 12-inch girders set 18 inches apart. The building is 24 feet wide and 26 feet long and is heated by hot water. On the garage floor is a turntable which is unique in that it is made of channel iron, which raises it a bit from the floor. The idea of this is to prevent the accumulation of gases under the turntable which might result in an explosion. The garage has a swinging hose over the wash rack, a 120-gallon gasoline tank and two 50-gallon lubricating oil receptacles of the Bowser type. Upstairs are the living rooms—kitchen, bedroom, living room and extra room. Three big cars can be accommodated in the garage.

Over on the west side the garage of J. M. Baker, at 1429 Washington boulevard, is a model of its kind. It is 25 by 30 feet and cost $3,800. It accommodates a limousine and a runabout and has a glazed brick interior and a tile roof. In the way of utilities there is a 120-gallon gasoline tank and a 65-gallon lubricating cabinet; a work bench 18 inches deep; a sink for testing inner tubes, and a pit. The entire place is lighted by electricity and is regarded as a model of its kind by west side motorists.



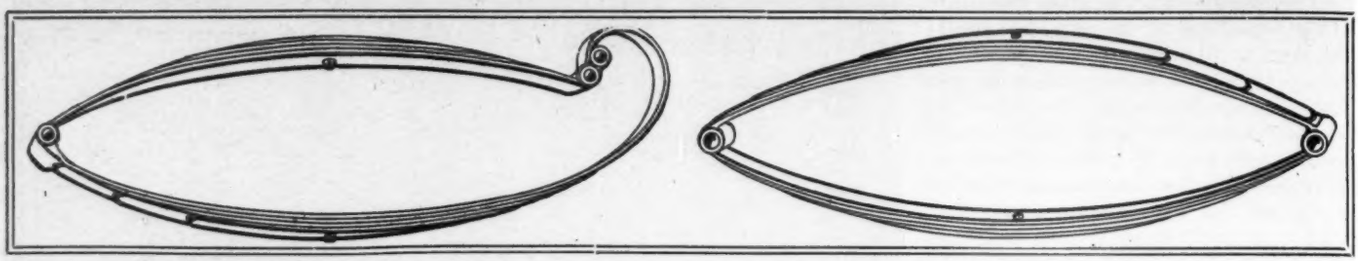
W. H. Fahrney Has Forge and Machine Bench



Interior View of Garage of J. M. Baker

H. H. Boore's Garage and Its Equipment

THEORY AND PRACTICE IN CAR SPRINGS



FULL-ELLIPTIC SPRING WITH END SCROLL

FULL-ELLIPTIC SPRING

THE reason for the adoption of springs will best be understood if we take into account a version of the law of the application of forces. As, for illustration, if a tup is tripped and it falls 10 feet, provided it weighs 100 pounds, the energy of position of the tup will represent 1,000 foot-pounds, and when it strikes the energy will be expended, manifesting itself in heat and other vibrations. It cannot be said that the effective force of the blow will be as 1,000 food-pounds, because the effectiveness of the impact of the tup will depend upon the distance in which the motion is arrested. If, for instance, the motion is arrested inside of a distance of 1 inch after initial contact, the blow will be equal to, say, unity. But if the blow is arrested within ½ inch after initial contact, the force of the blow will be doubled. But should the anvil give but a thousandth of an inch, the force of the blow will be equivalent to one thousand times the force as first put down.

In this we have an illustration of the fact that it is not the weight of the body or the distance it travels that goes to make the sum total of results; indeed, it is a question of the distance in which motion is arrested for the most part. Coming down to the motor car, it is plain to be seen that the spring suspension of a chassis frame and the superimposed body will be effective in proportion as the springs show capability, by way of arresting the motion within the distance said to be agreeable and at a periodicity of the pendulum action also said to be agreeable.

Obviously, then, there is no standard to go by, because what one man calls agreeable, another may call something else. On the other hand, this question of what constitutes an agreeable motion can be put to some extent in dollars cost, since the anticipations of pleasurable riding will depend considerably upon how much the motorist has to pay for the pleasure. If a car is high in price, and the spring action is so terrible as not to compare favorably with the spring action in comparatively low-priced cars, the unlucky motorist will consider the action disagreeable, and justly so. If, on the other hand, a car is very low priced, the purchaser thereof may be quite well satisfied with a very inferior spring performance. He may, for that matter, get all that he pays for. Under these conditions, it is difficult to appreciate what should constitute the standard spring suspension from the point of view of result, rather than the point of view of the manner of suspension.

EDITOR'S NOTE—This is Part I of an article specially prepared by Thomas J. Fay, President Society of Automobile Engineers, on the Theory and Practice of Spring Suspension. Part II will appear in next week's issue.

If some types of springs do the work, affording better results than do others, it would seem as if the springs of the inferior results should be eliminated. On the other hand some types of springs work well on certain classes of cars and are valueless in other cases. This being so, it does not follow that all springs should be of the same type and all cars should be swung in the same way.

Many Types of Springs

In relation to this matter it might be thought the types could be arranged after some fashion logical. On second thought it is to conclude there is no logic in this connection, because the several types of springs were used from time to time on all the types of cars extant. It will not seem out of place, therefore, to enumerate the types of springs largely as they appear on cars at the present time. They may be set down as follows: Half-elliptical; full-elliptical; full-elliptical, one end scroll; full-elliptical, both ends scroll; three-quarter elliptical; three-quarter elliptical, one end scroll; three-quarter elliptical, riveted end; platform; concord; helical.

Each of these types of springs is shown and each of them will be found in cars, unless it is a fact that the helical spring is no longer used as a direct suspension, or has it ever been to any great extent, although it is well represented in the shock absorbers of the day.

Considering laminated plate springs, since they are all modifications, they can all be resolved through the use of a single formula by a step to step process. Such a formula, for illustration, might be as follows:

$$N = \frac{W\ S\ k}{b\ t^2}$$

in which:

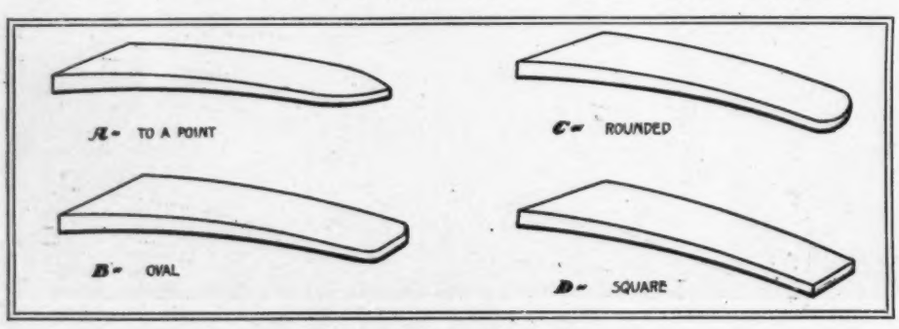
S = span in inches;
b = breadth of plates in inches;
t = thickness of plates in inches;
W = load in tons, 2,240 pounds;
N = number of plates;
k = a figure of convenience = 11 in ordinary work = 15 in the best motor car practice, and can have values between 11 and 15 as the exigencies of the service may indicate.

Kinds of Spring Plates

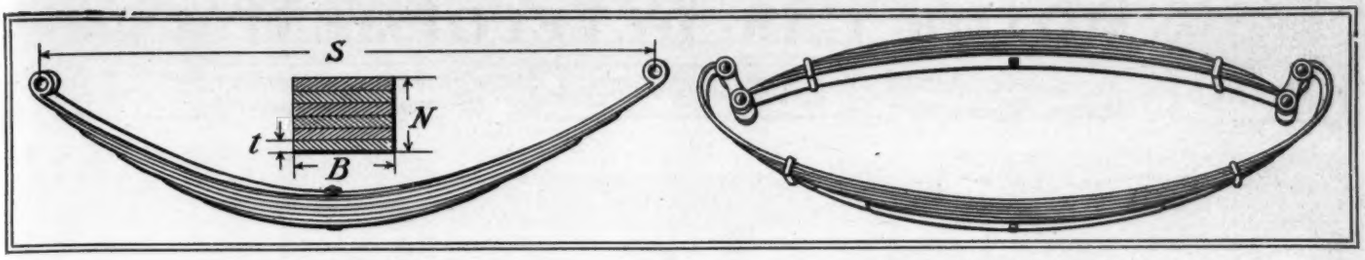
In laminated springs the plates are usually with round edges, but are not flat, as may be generally supposed. They are concave, and the difference of the thickness at the center is about equal to 1 B. W. G. thickness. Such plates are used in sizes as follows:

B. W. G. Nos.	Thickness in Inches
0	.34
1	.30
2	.284
3	.259
4	.238
5	.22

In motor car work there are few, if any, examples of springs, in which the thickness of plates will be found, to be thinner than No. 5, or thicker than No. 0, B. W. G. In some cases the plates are quite rectangular in section, the edges being flat, with a slight radii at the corners. In other cases the spring leaves are ribbed, illustrations of which will be found elsewhere in this article. There is one other point,



VARIED TYPES OF SPRING LEAVES ENDINGS



SEMI-ELLIPTIC SPRING

FULL-ELLIPTIC SCROLL SPRING

as illustrated, which takes into account the contours of the ends of the short plates. It is believed by some spring makers, and the author has a superstition or two in relation to the same matter, that the behavior of a spring is effected by the shape or contour of the ends of the short leaves or plates. At all events, the short plates should be tapered down toward their ends, and if a supple spring is the aim of the designer it might even be well to terminate the ends of the short leaves in what is designated as the French contour. This contour looks very well in the finished product and possesses the advantage of more gradually bringing the shorter leaves to the support of those of greater length.

To Get Easy Riding

While this question of suppleness of springs, which might otherwise be termed easy riding qualities, is on the tapis, it will not be out of place to discuss some of the means by which easy riding qualities may be arrived at. In the first instance it is passing strange that the designers of some cars should expect any one to furnish springs such as would afford easy riding qualities. Take, for illustration, a limousine of the most approved artistic appearance, let us say of aluminum. If the aluminum is backed by plaster of paris and a goodly showing of hardwood, by way of a framing, and if this limousine is hoisted by means of a traveling crane, suggested because of its weight, onto the chassis of a car in which the center of gravity might be high, not taking into account the effect of the body, as above described, the work the springs would have to do can scarcely be regarded as coming within the province of springs.

The conditions are not all included, because it is just such a body and just the car described that will have a water tank on the deck of the limousine and perhaps two or three tire cases and other paraphernalia. The top hamper. therefore, mount up to figures quite beyond the top hamper that should obtain, even under more favorable conditions. There are no springs, either by way of types, or in the matter of design, that will afford easy riding qualities under the conditions as above illustrated. Indeed, it may be fortunate, but it is a fact, too, that there are no tires that will sustain under such conditions, and so we may say, if the spring problem is severe, the tire problem becomes impossible.

Vital Spring Considerations

In spring making there are matters to be considered as follows: The materials of which the springs should be made; the facilities for use in fashioning the spring plates; the facilities for use in heat-treating the spring plates; the design of the springs with a view to the work to be done; the manner in which the springs shall be tested. As respects the material, enough is to say they will be given separate space hereafter. When it comes to the question of the facilities for use, in fashioning the spring plates, it will be easier to state what should not be done rather than to elaborate upon the other phase of the question. At all events, the material comes in mill lengths, and the leaves or plates have to be cut from this material, so that the first thing to consider is whether or not the texture of the material is altered by the shearing process used in cutting the spring plates from the lengths as they come from the mill. The writer is of the opinion that the texture of the material is altered for perhaps a ½ back from the point of shear, and so it would seem that the lengths as cut from the mill lengths to make the leaves should be somewhat longer than will be required in the actual finished product.

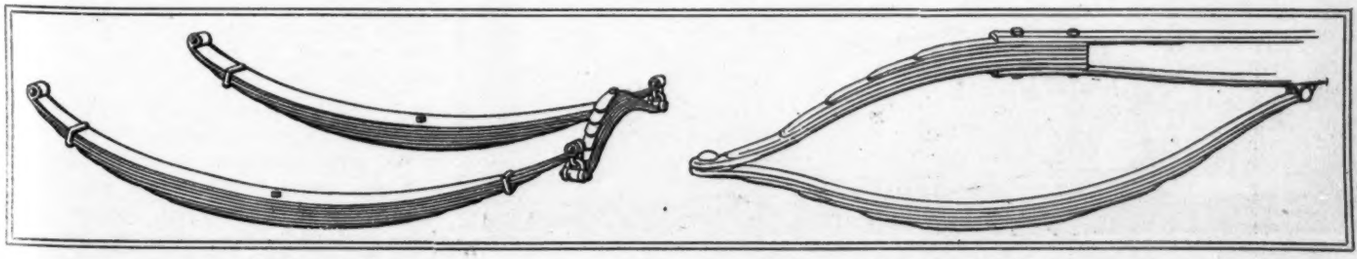
Thickness of Leaves

The next question to be taken into account is that involving the thickness of the leaves in a given spring. Shall all leaves be of one thickness, or shall we have all of one thickness, excepting the main leaf, which might be of a greater thickness, or shall all the leaves be of a different thickness? The spring maker will have his say, because he sells the springs by the pound and because the more plates he has to handle per pound the more work he will have to do per dollar. If the spring maker fixes the pound price first he will then be inclined to fix upon the least possible number of leaves for the spring, thus giving him the maximum weight for the minimum cost, hence increasing his profit at a previously fixed price.

It is not intended to say that spring makers deliberately start out with the idea of skinning, but it is believed that they may beguile themselves into thinking that the fewer the number of plates in a given spring the less the chance of breakage for that reason alone. Of course, they know that for a given camber, the thicker the leaf the greater will be the extreme fiber strain, and with them it is a compromise as between cost and risk of breakage, due to overstepping the bounds from a fiber strain point of view. The same spring makers are justified in their course to some extent, for the reason that easy riding qualities are more nearly approached as the fiber strain in the material used more nearly approaches the elastic limit of that material.

Badger Trade Good

The fall in Wisconsin trade is the best since the introduction of the motor car, and agents say that but for the weather, it might as well be regarded as next spring, considering the demand for 1909 models. The condition is unusual. Heretofore prospective buyers have been somewhat indifferent when the first new models arrived, and the run of orders was not placed until early spring. However, this fall there has been an early rush of prospective buyers.



PLATFORM SPRING

THREE-QUARTER ELLIPTIC SPRING

MOTOR CAR DEVELOPMENT

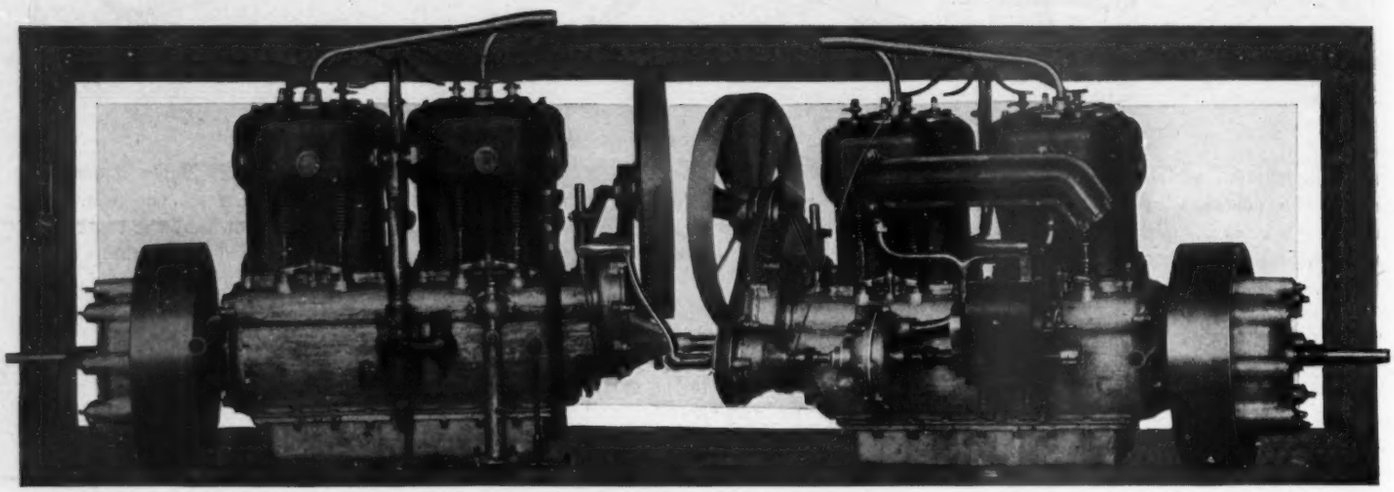


FIG. 1—THE NEW MARMON MOTOR EMPLOYED ON THE SMALL CAR FOR NEXT YEAR

OF the many 2,000-pound small cars for the 1909 trade that already have been announced—and that will be announced—in the course of the coming month, few will receive more favorable comment than the small Marmon, a 32-horsepower machine with a four-cylinder 4½ by 4¼-inch motor, expanding band clutch, selective gearset on the rear axle, and many other points of construction never before associated with the Nordyke & Marmon Co. and its Indianapolis factory. This new car, which has been in course of preparation for 10 months, is the handiwork of Howard Marmon, the designer, who made a careful study of the many continental small cars, as well as different American ones, before making his final decision. It will be built as a five-passenger touring car, a four-passenger tourabout, a two-passenger car, and a coupe. The announcement of the details of construction of the car is particularly interesting, because it reveals from end to end a nicety of construction, a very apparent recognition of weight required for work to be done, and a simplicity of outlay in the many parts.

The motor differs from previous Marmon types in that it uses the tubular style of crankcase, which takes end plates, that at the front forming a housing for the half-time gears, and the one at the rear allowing for entering the crankshaft from that end, while the camshaft enters from the forward end. There is an oil compartment in the form of a deep base part. The crankcase support is entirely new in that the rear end is through a transverse tube passing through an eye hole in the rear end of the crankcase and reposing on brackets on the side members of the frame. The front support is a single trunnion in a crosspiece of the frame. The motor is a good study in symmetry, with its opposite valve chambers for intakes and exhausts, and having the Schebler carbureter and oiler on the right with water pump and magneto on the left. The three-bearing crankshaft is carried on Parsons white brass bearings, and is bored for lubricating purposes in the usual Marmon style. Connecting rods are drop forgings, with lower ends fitted with Parsons white brass, the upper ends bronze. Both camshafts, contained within the crankcase, have cams keyed and pinned in position, and the valve action is direct through lifter-rods carrying rollers on their lower ends. The interposed transverse lever used on the big Marmon car, between the camshaft and the push-rods being eliminated. A novel adjustment of the lifter-rods is provided by boring the top of the lifter and inserting therein a T-piece with a series of washers or shims between the T-piece and the top of the lifter-rod. This is a very simple adjustment but one capable of the greatest delicacy.

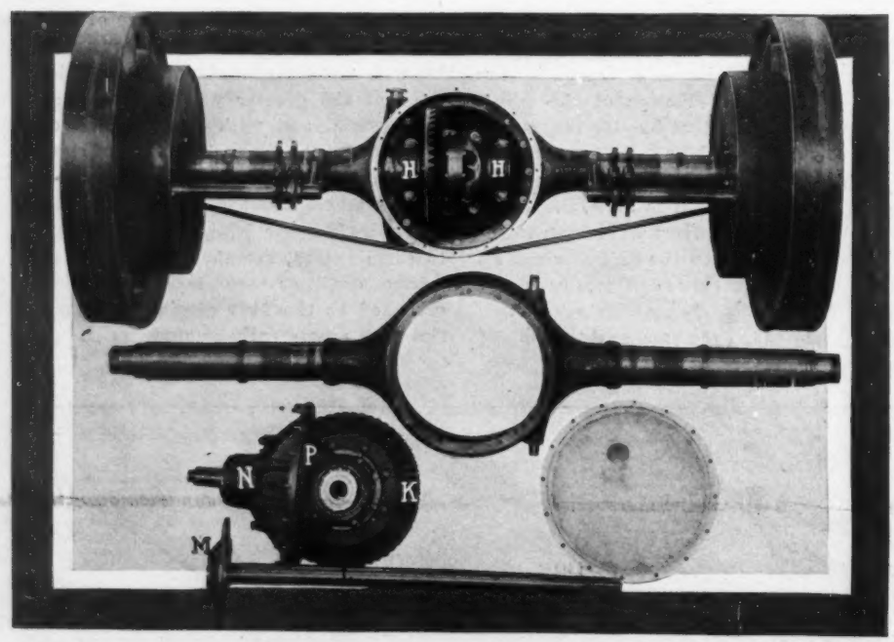


FIG. 2—MARMON REAR AXLE CONSTRUCTION

The oiling system is new in that the gear-driven oiler on the right side of the motor is placed on a level with the base of the crankcase and driven off the intake camshaft by spiral gears. The oil flow from this pump is carried within the crankcase through copper leads leaded into a recess in the surface of the case to the three crankshaft bearings, whence it passes through the bored crankshaft to the lower connecting rod bearings. Oil ducts lead up to the connecting rods to the wristpins, thereby giving a positive

NEW MARMON SMALL CAR

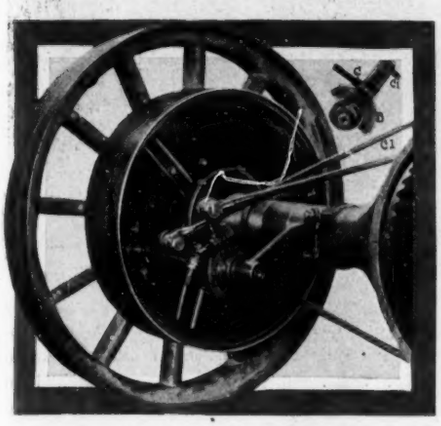


FIG. 3—MARMON BRAKE ADJUSTMENT

lubrication from the pump to the five bearings of the crankshaft and the four wristpins. Within the crankcase a splash is maintained for the benefit of the cylinder walls. An oil level is fitted for the purpose of showing the amount in the crankcase and a pressure gauge on the dash is fitted also.

In the ignition system, which is a dual one, with one set of plugs for the battery and magneto system, the timer and commutator are discontinued. This is accomplished by using the magneto distributer for the battery current, which is passed through a non-vibrating coil on its way to the distributer. This gives a simple system, with very little wiring. The magneto is removable through its jaw coupling to the clutch shaft and the high-tension wires from it are conducted through a tubing between the cylinders.

Cooling is through a tubular radiator assisted by adjustable belt-driven fan. The Marmon company always has shown care in its radiator support, which this year is through trunnions on the side members of the frame.

The departure from the multiple-disk to an expanding ring clutch shows the careful study in the reduction of weight, the expanding clutch being a simpler one to manufacture. The expanding ring is a steel band faced with thermoid operating within the steel drum on the flywheel. It is not shown in either of the motor illustrations. The ring is expanded by toggle action and lubrication of the clutch is from the motor.

Most interesting in this new car is the rear axle system, because of the new 1909 Marmon brake, the new rear axle construction and the carrying of the transmission on the axle. In the axle construction Fig. 5, A is the central pressed steel expansion which carries the differential and is continued in tubular form through the wheel hubs, giving a complete floating axle construction. This housing has its differential part in the form of a ring, opened from the rear. The rear is ordinarily closed by a large aluminum plate, which, when removed, permits the differential as a unit being taken out. To the forward space of the housing is bolted the aluminum bell-shaped gearbox B, which accommodates the three-speeds selective set with the mainshaft on top and the countershaft directly beneath. Chrome nickel steel is employed in all parts of the transmission shaft, with the exception of the bevel gear, and the caged type of Hess-Bright bearings regularly employed. Instead of using a set of radius rods, or a torsion bar, the driveshaft is enclosed in a tubing C, brazed into a flanged end piece, which bolts to the forward end of the gearbox. The forward end of the propellorshaft C is carried in a ball-and-socket support on a crosspiece of the frame, at which point is placed the only universal joint in the piston. An interesting system of bracing is employed, consisting of diverging brace-rods D to the ends of the axle housing, and a truss-rod E with turn buckle which passes beneath the propellorshaft and under the gearbox. A truss-rod F is used beneath the rear axle. In this illustration G shows the two shifter-bars of the gearset which, in the perfected car, will be ensconced in an oval tubing, so that the entire gear-shifting part will be enclosed.

In this gearset all is removable through the rear of the differential, which is shown in Fig. 2, which is an illustration of the big Marmon car, but in which the construction is the same as in the small model. By removing the bearing caps H the complete differential is withdrawn as the unit K. After it is withdrawn, the removing of a dividing plate between the differential of the transmission part which holds the Hess-Bright bearings for the rear of the gearset allows both shafts of the gearset to be withdrawn without disassembling the axle in the least, or removing the gearcase housing. The floating axle driveshaft L is squared at its inner end and carries the flange M at its outer end, bolting to the wheel hub instead of coupling with the hub, as in the generally adopted male-and-female clutch constructions. In this axle there is but one bearing for each rear wheel, an accepted European construction. A patented portion of the differential is casting integral with the supporting part N, the portion P, which partly encloses the pinion and forms a support for the Hess-Bright bearing at the rear of it, thus carrying this

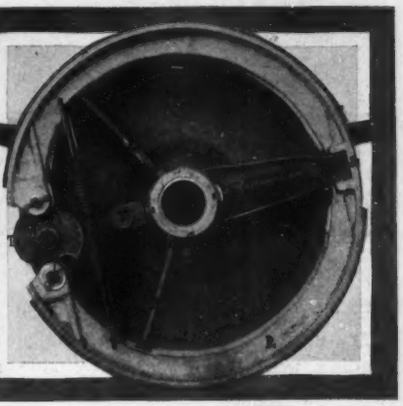


FIG. 4—MARMON BRAKES

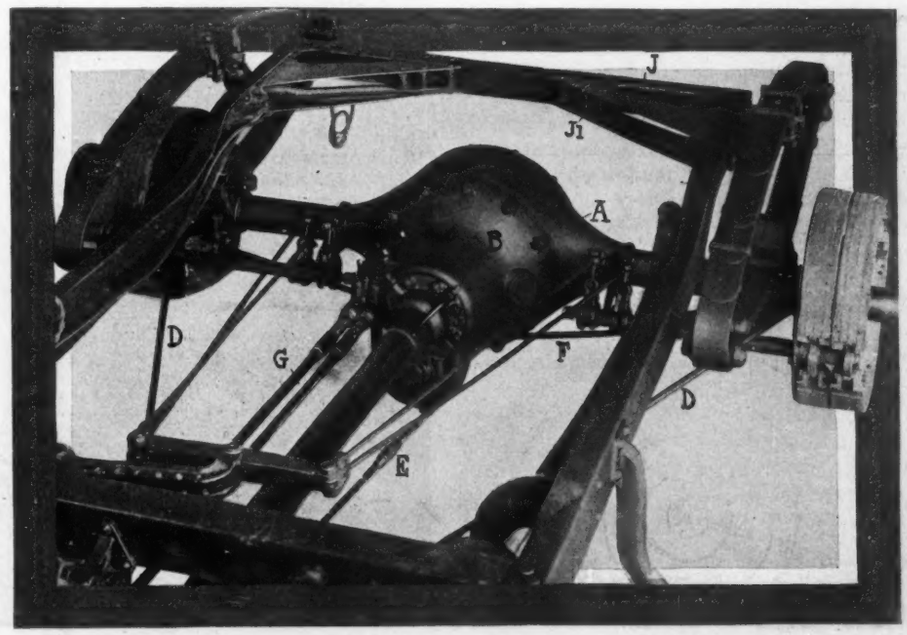
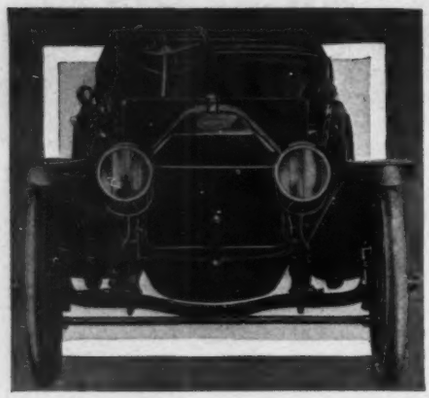


FIG. 5—MARMON SMALL CAR HAS REAR AXLE GEARSET



MARMON SMALL CAR

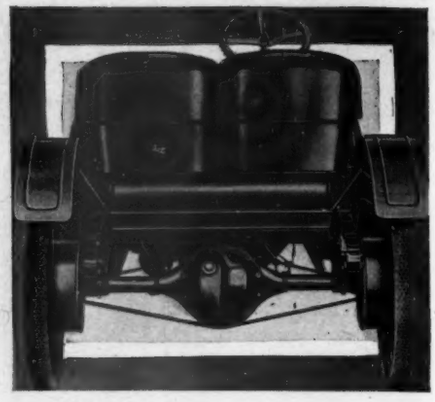
pinion between two Hess-Bright bearings.

The new Marmon brakes are of the expanding type carried side by side and operating within the same drum on the rear axle, which is 14 inches in diameter and of sufficient width to accommodate the two expanding bands made 2 inches wide each. These bands, Fig. 4, are faced with thermoid and are supported by a carrier S, whose squared end fits in the slot S1, thereby giving a floating ring construction. The free ends are expanded by a double cam T which bears upon rollers in the brake band. Immediate releasal is obtained by the coil spring W, which is permitted to act beyond a certain degree by the adjustable rod X. Y is a pivoted support between the axle housing and the shaft carrying the cams T. The particular novelty about these brakes is the delicate worm and sector method of adjustment, illustrated in Fig. 3, which shows their attachment on the big Marmon car. In this illustration, A is the sleeve carrying the expanding cam for the inside brake rim and on the outer end of this sleeve is a sector B. A yoke bracket D, whose upper end connects with the brake rod C1, carries a worm C in mesh with the sector B, and by rotation of this worm any desired adjustment can be obtained, which is accomplished without interfering in any regard with the brake connection. In the large car these are supported by arms H on the axle housing, being carried in the rear of the housing; whereas, on the small car, as illustrated in Fig. 5, they are carried in front of the axle housing. The outer sector B1 is carried on a shaft which extends within the sleeve A and carries the expanding ring which is closest to the car wheel.

Particular attention to the running gear is called in the employment of the conventional pressed steel frame, which in this small car supersedes the double three-point suspension frames on the bigger models. The motor is carried direct on the side members of the frame, eliminating the sub-frame construction. The side members being raised 3 inches in the rear permit of a 5¾-inch action for the full elliptic springs, which will be used in place of the scroll type illustrated. The support of the frame on these springs is well taken by the large gusset plates J in the corners, Fig. 5, and further by the bracket gorging J1, whose outer end forms a trunnion support for the spring and attaches to the side members of the frame as well as being continued through the gusset plate. Semi-elliptic springs are used in front, these being 35 inches long and placed on the axle 15 inches from the front end and 20 from the rear, which allows of carrying the radiator on the axle plane. This axle is an I-beam forging with vertical hub ends, which are carried in the jaws of the steering pivots. A Gemmer steering gear is fitted, and the tie-rod is in front of the axle, and the curved steering arm passes over instead of under the axle.

The bodies of this small car are of sheet metal construction instead of cast aluminum, as used on the big car, which results in a slight reduction of weight. In the five-passenger tourist style a particularly straight wood dash is employed, which does not carry a single encumbrance.

This Marmon car uses in practically all of its parts the same materials as used in the big car model which Motor Age expects to describe in these columns at a later date. The brakes are identical in construction and so is the back axle housing. In this small car every effort has been made to reduce weight and conserve strength.



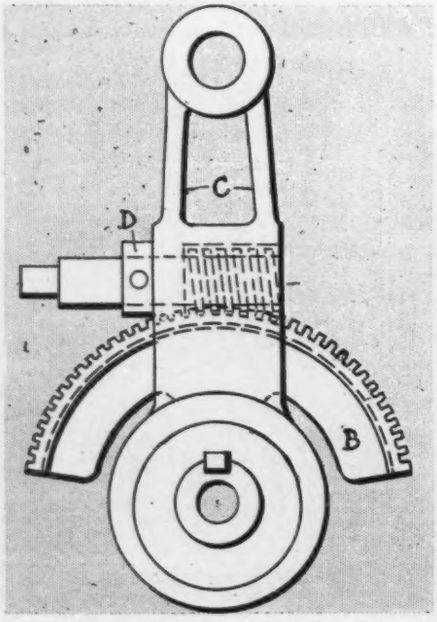
MARMON SMALL CAR

ROBERTS' TIMER

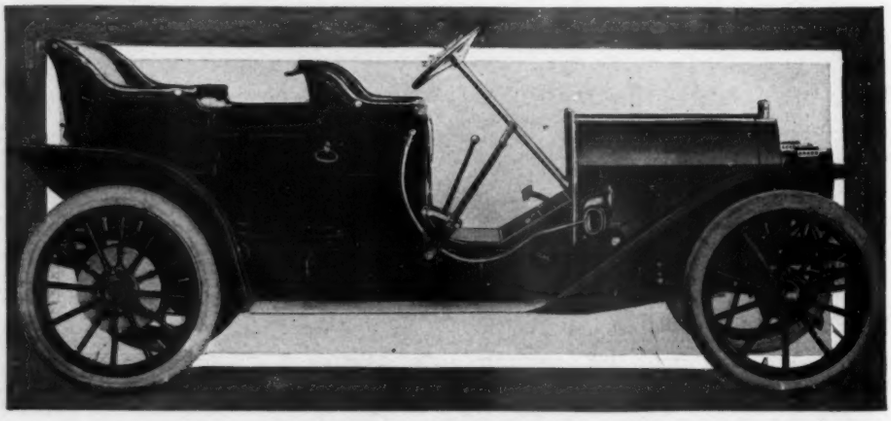
The Robert Instrument Co., Detroit, Mich., manufactures a timer for motors with any number of cylinders from one to six. These timers make use of a revolving brush of the roller type and stationary contacts of non-corrosive steel. The stationary contacts are well insulated in a hard, red fiber part. The entire timer parts are held in a solid brass case and bearings are of steel.

RAMBLER SPARE WHEEL

Thomas B. Jeffery & Co., Kenosha, Wis., have for the 1909 season adopted the novel plan of fitting all four-cylinder cars with a complete spare wheel, which is carried on the side of the car. In case of a puncture of either front or rear, the punctured tire is not removed, but the entire wheel, with the exception of the hub center, is taken off, and the spare wheel with its inflated tire put on. This change, the company claims, can be made in 3 minutes. Four illustrations show the method of accomplishing this. In Fig. 1, on the running board are the special tools, consisting of a wheel puller A and the socket wrench B. In removing the wheel, it is necessary to remove the six nuts, desig-



WORM-AND-SEGMENT BRAKE ADJUSTMENT



SIDE VIEW OF MARMON 1909 SMALL CAR

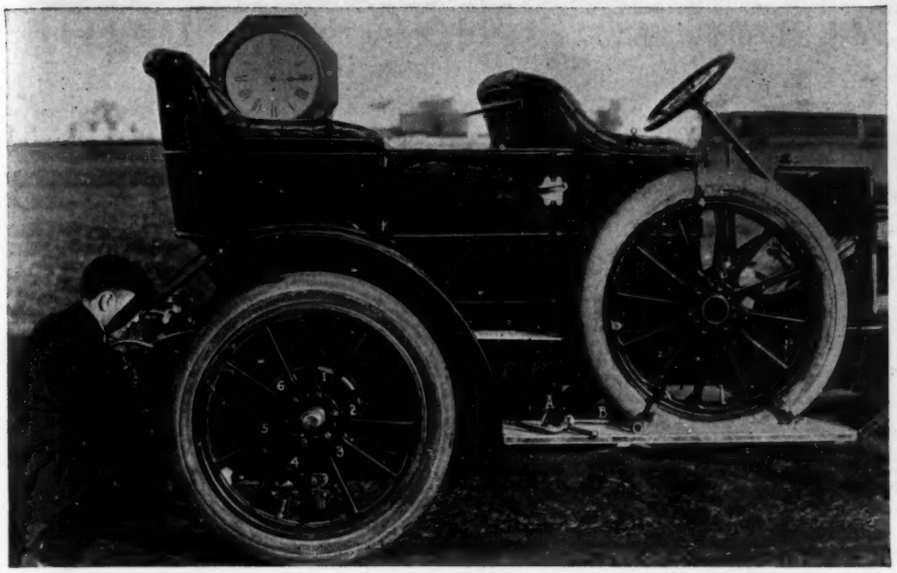


FIG. 1—THE 1909 RAMBLER SPARE WHEEL

nated 1, 2, 3, 4, 5, 6 in this illustration, which is done with the socket wrench B after the wheel is jacked up. Fig. 2 shows them removed and the operator in the act of taking off the wheel with the wheel puller A. In Fig. 3 the wheel is off. This illustration shows the brake drum part H, to which the wheel is bolted and which is not removed in making the change. In Fig. 4 the operation is complete. On the right running board of the car wheel special brackets are provided for carrying the spare wheel.

MOTOR CAR LITERATURE

In a small booklet called "Points on Appointments" the Peerless company illustrates its limousine and landaulet cars, and gives detailed measurement relative to the enclosed compartments.

"To Philadelphia and Return" is a twenty-four page route book published by the Automobile Club of Pittsburg, covering the route from Pittsburg to Philadelphia and back by way of Bedford Springs. The book is an excellent example of what a club can do in the line of road information of this nature.

The advance catalog of Gaeth cars for 1909 illustrates them in five and seven-passenger types, and also in limousine and commercial styles.

"Motor Talk" for September contains a story on the Long Island motor parkway and a trip through Normandy and Brittany, in addition to other information.

The Ford Times of November 1 contains a two-page story on the magneto construction used in Ford 1909 cars, which, by the way, is incorporated in the flywheel of the motor.

"Two Weeks" is a most artistic booklet, published by R. M. Owen & Co., telling about the happenings on the Glidden tour. It is well illustrated and tells a day-by-day story of the run, bringing out the road features and incidentally mentioning the performance of the Reo cars on this run.

The October Monthly Bulletin of the Automobile Club of Philadelphia contains four road routes, these being Doylestown to Bristol via Newton, Langhorne and Hulmadille; Bristol to Doylestown, returning over the same course; Philadelphia to Washington Crossing and return.

Catalog No. 17 on the Apperson cars follows the general type of booklet previously issued by this company in which the cars are minutely described and the different styles illustrated.

A novel scheme adopted by the Packard company is "A Blue Print" folder, on one side of which are shown twelve body styles of commercial vehicles of the 3-ton truck manufactured by this company.

The Baum Iron Co., Omaha, Neb., has issued a catalog covering its motor car-supply department, in which are listed illustrated and specified, all styles of motors, planetary transmissions, steering gears, chains, forgings, mufflers, lubricating and ignition parts, carbureters, jacks, lamps and parts, and, in fact, everything in the supply line. The catalogue also lists tires, tire repair parts, and various tools.

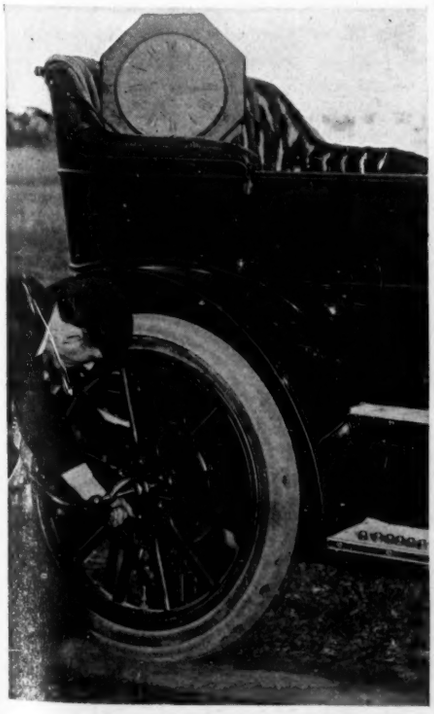


FIG. 2

FIG. 3

FIG. 4

LACOIN CRITICIZES THE TIMING OF MOTORS

EDITOR'S NOTE—The following is Part II of a translation by Charles B. Hayward from article by Louis Lacoin, and published by Omnia, a French contemporary. The present article, Part II, contains a description of the Larrad instrument for timing motors. Part I appeared in Motor Age October 22, pages 28, 29 and 30.

WE have already shown that it is necessary to wait until there is a certain degree of depression in the cylinder before opening the inlet valve, and it will be apparent that even a considerable lag will produce but little depression. If the cylindrical volume be ¾ liter, or 750 cubic centimeters, and the dead space ¼ liter, or 250 cubic centimeters, a displacement of 25 cubic centimeters is necessary to produce in the cylinder a vacuum of 0.1 atmosphere. Now, 25 cubic centimeters correspond to 4 millimeters of the stroke for a piston having a stroke of 120 millimeters. Cylinder 89 by 120 millimeters= 750 cubic centimeters. It is hardly necessary to state why an excessive lag should not be given the opening of the inlet valve, though such a practice would not be attended by any serious inconvenience, while a premature opening of the valve would permit the entrance of an excessive amount of air. This consideration explains the lag of the motors already mentioned, as well as the following: Ours 1, 15 degrees; Hotchkiss 7, 17 degrees; Brouhot 9, Rochet-Schneider and Cornilleau Sainte Beuve 10, 20 degrees; Berliet the same as Hotchkiss, and Aries 25, 18 degrees. Larrad recommends 17 degrees.

Which Should Operate First?

This brings us to the third question, which is raised by the timing of the Mutel 11, Larrad 31 and the Peugeot 17. Larrad, for example, recommends a 17-degree lag for the inlet and 22 degrees for the exhaust. During the intervening 5 degrees, both valves are open. Is this an advantage? But it can easily be seen that Larrad's theory can be sustained. Valves do not operate instantaneously, he maintains. If the inlet valve begins to open 17 degrees beyond the dead center, 5 degrees later, it will not be open more than a fraction of a millimeter. Likewise, if the exhaust valve remains up to the twenty-second degree, at the seventeenth it would not have been much nearer to closing, and the advantage is gained that the inlet and exhaust are both more free during their limited period, while the fact of both valves being open at the same time produces, with mechanically operated valves, the same effect as is realized with the automatic valve; the exhaust continues as long as there is any excess of pressure in the cylinder, and the aspiration commences the moment there is any depression. This point is easily demonstrated as the movement of the gas in the exhaust manifold does not cease instantaneously. The inertia of the gaseous mass continues to draw out the last particles of burnt gas, despite the opening of the inlet valve, and when the exhaust closes, the inlet already being open, the introduction of the fresh gas immediately begins. To this, it might be said that if the beginning of the aspiration had any great influence on the power of the motor, or upon its efficiency, this theory would not be debatable, or would at least be well justified. But it has neither. The slight initial depression scarcely has any effect on the upward movement of piston, particularly as it is so shortly afterward descending under the ordinary depression of aspiration.

So far as the volume of fresh gas introduced during the admission stroke, this may be measured by the displacement of the piston between the point that the exhaust valve closes and the point of closing the inlet valve in turn, assuming in both cases that an equilibrium of pressure has been established between the interior of the cylinder and the external air. Thus it matters little whether the inlet valve opens before or after the exhaust. If the exhaust closes, for example, when the piston has descended 1.5 millimeters of its stroke, and the inlet opens but an instant later, the first inrush of fresh gas will begin to fill the space traveled by the piston after this 1.5 millimeters of the stroke; the introduction of the gas will be somewhat retarded, but it will take place nevertheless. If the inlet valve is closed 6 millimeters after the piston has reached the dead center, there will be 6 millimeters of the stroke less explosive gas in the cylinder and the useful volume will be reduced by 1.5 millimeters at the beginning and 6 millimeters at the end, or 7.5 millimeters, or a deficit of .075 per cent, assuming the length of the stroke to be 100 m. This reduction of the volume and the consequent loss of power must be regarded as a necessary evil, for if the valves were opened and closed at the dead center, the loss would be even greater.

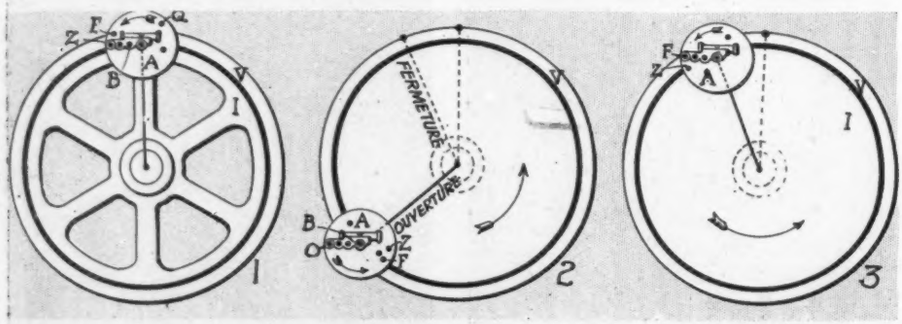


Fig. 4—Larrad apparatus mounted between the cone and flywheel. 1, position of upper dead center; 2, position of opening of exhaust; 3, position of closing of exhaust. A, disc, pierced with holes; B, spirit level; F, closing of exhaust; H, dead center point; I, clutch cone; O, opening of exhaust; V, flywheel; Z, upper dead center point.

Should Both Valves Be Open at Once?

We are still far from having arrived at an answer to the third question and it is now opportune to revert to it. It seems that among those, such as the Unic 29, for example, which allow an interval of 24 degrees between the closing of the exhaust and the opening of the inlet, and those which, like the Larrad, open the inlet before closing the exhaust, there is certainly a sufficient range in which to find a mean. Without exaggerating the lag given the opening of the inlet, it seems to us that it should be slightly later than the closing of the exhaust. Imperfections in the actual timing on the motor itself will soon suffice to modify the predetermined arrangement by 4 or 5 degrees. Take a motor with a complete index on the periphery of its flywheel and a pointer on the crankcase corresponding to it, and order a repairman to time it exactly, and it is quite probable that, whatever be his skill, he will not strike it by several degrees. As a mean average, it may be estimated that this error will amount to 2 degrees each way, or 4 degrees in all, and it would seem necessary from this to open the inlet 4 degrees after the closing of the exhaust. This is the regulation of the Eudelin 21, the exhaust having 4 degrees lag, and the inlet 8 degrees, while the Motobloc 5 is practically similar with 5 and 10 degrees. The Hotchkiss 7 allows slightly more, the exhaust having 10 degrees and the inlet 17 degrees, the Berliet 12 being still further apart, i. e., 9 and 17 degrees, or 8 degrees apart. These figures all appear well founded.

Should we, in view of all these diverse timing arrangements, attempt to distinguish what may be called the typical regulation? We hardly believe so, for, as we have already mentioned a number of times, the amount of advance or lag depends upon a number of variables in one motor and another; we might almost say from one cylinder to another, and those who have made much use of the manograph would probably not differ with this. A standard regulation would then be very poor for extreme cases, and if the little instrument of which we have been speaking could improve many of the timing arrangements, it could hardly pretend to produce the maximum output or efficiency in every

case, as its inventor claims. But in spite of all, we can by way of further information give a résumé of the mean of all the angles as compared with the Larrad. These are:

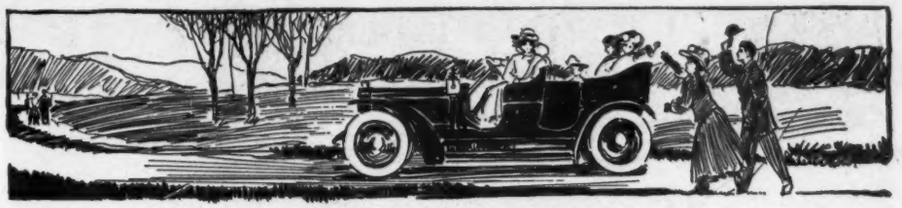
	Mean average	Larrad
Lead given the exhaust valve..	46°20′	52°
Lag in closing inlet valve.....	25°32′	17°
Advance of the ignition.....	31°15′	var.
Lag in closing exhaust valve..	5° 8′	22°
Lag in opening inlet valve.....	12°16′	17°

The Brasier 16 shows a remarkably close approach to this mean, coming within 5 degrees of it, while its revolutions per minute rate is also near the average, 1,350, instead of 1,370, the length of its conecting rod being the same, 4.5 instead of 4.6. It is not to be inferred from this that many of the others are not equally good. The best are to be found in the Motobloc 5, Hotchkiss 7, Cottin Desgoutes 8, Cornilleau Sainte Beuve 10, Mutel 11, Berliet 12, Eudelin 21, Farcot 22, Aries 25, Sultan 27, Renault 28 and Unic 29. In order to be able to judge of the others, it would be necessary to know more about their mechanical arrangements.

Having divided these degrees of the circumference of the circle so carefully and arranged them as indicated, is it possible to learn the time in which the motor takes to traverse the various divisions? Take for example, No. 30; it makes 1,700 revolutions per minute, describing in one second, 10,200 degrees. Each degree is thus divided into less than 0.0001 second, from which the extreme rapidity of the performance of each one of the parts of its cycle necessary to its efficient working may be realized. And still some designers refuse it a poor little thousandths of a second in which to perfect its exhaust. Those 10 degrees of retard would probably still further improve a motor already remarkable.

Description of the Larrad

As shown by the illustrations, Figs. 2 and 3, this device consists of a plate A,



mounted on a shaft E, integral with the piece D, a spirit level B, and the pin C. In the plate are three series of holes, while in the piece to which the spirit level is attached there are but three holes, one for each series, and the pin is used to insure the registration of any two holes. To use the device, the part D is attached to the crankshaft, or any part that turns with it, this being arranged so as to most conveniently suit the circumstances. For example, it could be placed between the cone and the flywheel where it would be firmly held against movement. Its only conditions of mounting are that the shaft E must be parallel to the axis of the crankshaft, so that when turned, this shaft will describe a circle round the axis of the motor shaft, and not a cone; second, that once the plate A has been fixed in position it can be revolved without coming in contact with anything. This second condition is frequently very difficult to comply with when a motor is mounted on the chassis, although the Larrad can be mounted on the starting crank, but the accuracy of the timing thus secured might be questionable.

Assuming that the piece D has been attached to the motor with the shaft E perfectly parallel with the axis of the crankshaft, the operation is commenced by registering the hole marked exhaust, with the hole zero, which corresponds to the upper dead center. The motor is then turned over, either with the crank, or by pushing on the flywheel until the piston reaches the upper dead center. The plate A is then turned until the spirit level shows that it is perfectly horizontal; the screw F is then tightened, fastening the plate A to the shaft E, and the device is then ready. See Fig. 4, No. 1. Then drawing out the pin C, it is inserted in the holes already mentioned, and the motor is turned until the spirit level is again horizontal. This will indicate the exact position at which the tappet should begin to raise the exhaust valve. See Fig. 4, No. 2. All the other essentials of the timing are regulated in the same manner and without removing the device from its support. In this manner the screw is inserted in the hole exhaust of the socket, and the hole marked closing, on the plate, the motor then being turned over again until the level indicates the horizontal. The instrument simply indicates the different positions of the crankshaft corresponding to the different essentials of the timing. It must be borne in mind in using it that the cycle occupies two revolutions of the motor, and that the plate A to which the level B is attached be so fixed that the direction of the arrow G corresponds with the direction of rotation of the motor. It will be seen that the apparatus is very easily employed and that it permits of great accuracy of regulation, besides avoiding errors. It is quite probably that with frequent use by different designers, they would be able to modify the plate to suit their own motors. Unfortunately, up to the present, the inventor has only provided the single plate mentioned, claiming that the regulation he has outlined is the only perfect one.

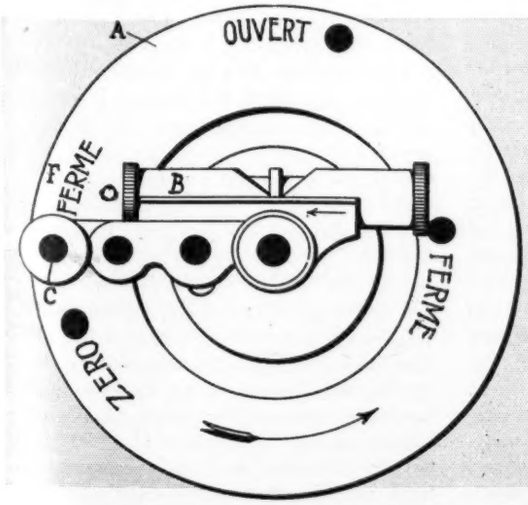


Fig. 2—Larrad apparatus for regulating the timing of motors. A, disk, pierced with a series of holes; B, spirit level, in the case of which is a hole for each of the preceding series; C, pin to secure holes in different positions. Arrow indicates direction of rotation.

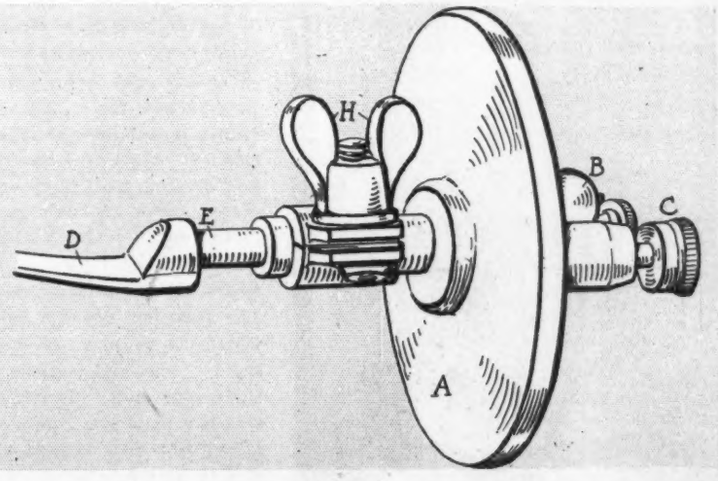
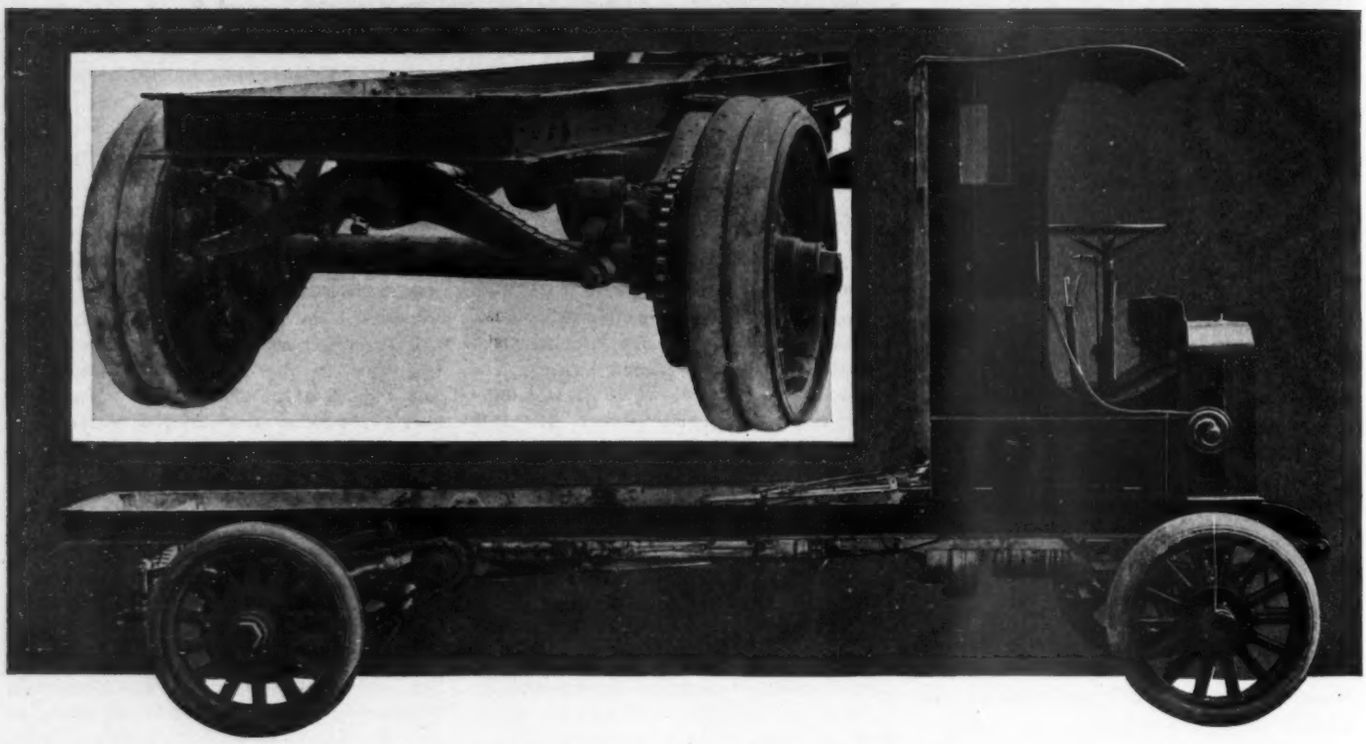


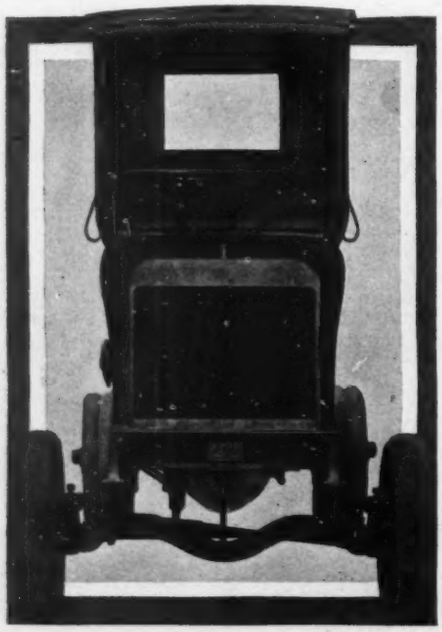
Fig. 3—Profile view of the Larrad. A, disk; B, spirit level; C, pin; D, blade for attaching; E, shaft to be fixed parallel with the crank-shaft; H, winged nut fixing disk A to shaft E. The description of this device appears in full on this page.

The Realm of the Commercial Car



CHASSIS AND REAR VIEW OF RAPID FOUR-CYLINDER, 5-TON TRUCK

THE Rapid Motor Vehicle Co., Pontiac, Mich., which since its inception has been an exponent of the two-cylinder type of 2,000-pound delivery wagon, announces for next year a 5-ton truck in which are such parts as four-cylinder vertical motor in front, multiple-disk clutch, and selective gearset, all of which are used for the first time in a Rapid vehicle, and take the place of the horizontal motor and planetary gearset previously employed. The 5-ton truck is a particularly stoutly-built high-powered vehicle, which an analysis of the running gear will show. The forward axle is a heavy I-beam member, with jaw ends for the steering knuckles and having a race of Timken bearings in the top arm of each jaw for taking the weight of the car. The front wheel spindles are heavy and fitted with Timken roller bearings. The rear axle is a straight member, circular cross section, and between it and the jackshaft sprockets are strut rods with turn buckles for adjusting the chains. The frame is a heavy channel steel construction with the lips outward. All unions are hot riveted and re-enforced with gusset plates. The transmission part is carried direct on this frame and its cross members, but the motor is supported on an angle steel subframe steel construction. The front springs are heavy semi-elliptics which at their front bolt direct to the spring horns and work in sliding blocks at their rear ends. The rear spring suspension is a platform type with all three members made with a great number of leaves, and the cross member located not beneath the back of the frame, but to a cross piece, some distance in advance of the rear end.



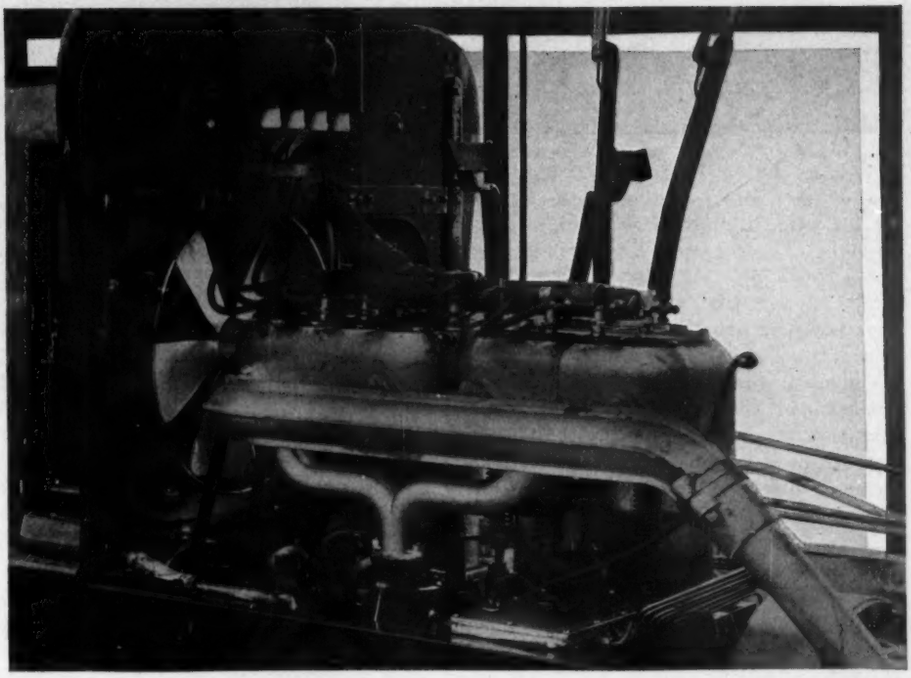
FRONT VIEW OF RAPID TRUCK

The general layout of the motor, which is located under the footboard and seat, is such as to economize space to the greatest extent, leaving a long load-carrying platform which is entirely free from obstructions. The motor, with its cylinders cast in pairs and having 5½-inch bore and 6½-inch stroke, had, according to A. L. A. M. rating, 48.4-horsepower, and is nominally rated at 60 by the company. The cylinder castings are integral affairs with valve ports on the left side for intake and exhaust valves. The heads are cut away to take large water plates. Use is made of a gray iron crankcase instead of the usual aluminum type, and the upper half of it supports the three bearings of the crankshaft. The coverings for the half-time gears are separate from the gearbox, so that these gears are packed in oil. The crankshaft is a hammered nickel steel forging, turned and ground to size; the camshaft has the cams keyed and pinned; intake and exhaust valves, made interchangeable, have nickel steel heads which are electrically welded to the carbon steel stem; the valve lifter-rods operate in long guides which are held by X-yokes in the crankcase, and other conventional constructions of four-cylinder motors are noted. Pistons carry four compression rings and oil grooves; connecting rods are drop forgings and wrist pins hollow steel pieces hardened and ground to exact size.

In the motor equipment, everything is grouped on the left, or valve side, the

mechanical oiler being opposite the rear cylinder, the carbureter centrally, the water pump in advance of it, and the magneto if used upposite the front cylinder. The fan is driven by belt from pulley on the camshaft, this pulley being located in rear of the half-time gear housing. The intake manifold is a curved T effect, the exhaust a one-piece horizontal three-ribbed affair. Between the cylinder castings on this side is carried the commutator supported in a housing which rests on the crankcase, and is attached thereto by two bolts. In the oiling, the seven leads go to the four cylinders and the crankshaft bearings, the overflow from these furnishing the splash oil level in the crankcase. Any excess above a predetermined level is pumped back to the oil reservoir to be used again. In the cooling system the flat-tube radiator is assisted by an enclosed aluminum fan, and centrifugal pump; particularly large water piping is used with hose connections.

First in the transmission system is the multiple-disk clutch with hardened steel plates, ground and running in oil; these plates are of large diameter and are carried entirely within the flywheel. The outer end of the clutch shaft is supported on a race of Timken roller bearings, which bearings take the thrust of the engagement spring. The clutch shaft is also provided with a brake, so that immediately the clutch is disengaged the brake reduces its spinning and thereby facilitates shifting of the gears. Because of carrying the selective gearset well to the rear, in order to use short side chains for driving and also have the jackshaft incorporated in the gearbox, a propellor shaft is inserted between the clutch and transmission, this shaft having a couple of universal joints. The gearbox is made of the usual two-part housing, the lower part being the supporting member and having all of the bearings attached to it, thereby reducing the role of the cover to that of an oil retainer. In this gearset, gears are made from Krupp chrome nickel steel with wide face. The short master shaft has its gear cut integrally with it. The main shaft of the gearset is carried on two races of Timken bearings and it has three keyways milled in it for attaching the sliding gears. The countershaft, also carried on Timken rollers, has integral flanges to which its gears are bolted. The jackshaft construction is without the usual spur or bevel gear differential and employs instead the Hedgeland equalizer, which makes use of but one spur-gear. This equalizer is also mounted on Timken roller bearings and bearings of this type carry the driveshafts of the jackshafts at the outer end, where they are a squared fit in the chain sprockets. This design gives a floating axle construction. The gear shifter yokes are forged steel, and a positive interlock is provided rendering the engagement of two sets of gears simultaneously impossible. The different gears are picked up by a single hand lever, requiring but a back and forward movement to get any gear change and not having the usual H quadrant. The braking force rests with four fiber-faced members, two of the contracting band type operating on jackshaft drums, and two of the expanding type acting within drums on the rear wheels. These rear wheel drums are bolted to all of the spokes of the wheel and carry the chain sprocket.

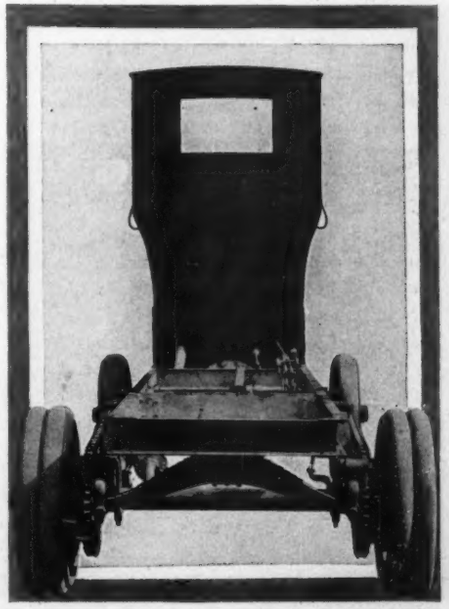


FOUR-CYLINDER, 48.4-HORSEPOWER MOTOR IN RAPID TRUCK

The truck, as illustrated, has a permanent canopy over the driver's seat, and inside control, having the change-speed lever and emergency brake lever inside the body and frame. The steering column is a vertical member connecting with this reversible type steering gear, the tie-rod of which between the knuckles is in rear of the axle. Although steel wheels may be fitted if desired, the illustration shows 36-inch artillery wheels used, the front pair carrying 6-inch solid rubber tires and the rear pair 4-inch dual type. Control is completely centered around the steering column.

BUILDING MOTOR STREET CARS

John C. Curtis, head of the Huntington Auto Transit Co., recently closed a contract with the Coppock Motor Car Co. of Decatur, Ind., for five Coppock motor street cars, which will be used for a rapid transit system in Huntington, Ind. These cars each have a capacity of fifteen passengers, driver and conductor, and the fare to be charged is the regular 5-cent fare with transfer privileges, each route running to the center of the city, where a garage, complete in every detail for taking care of the equipment, as well as a commodious waiting room, will be erected. The cars are made from designs of L. W. Coppock. The general plan of construction will be along the lines of a street car. There will be a platform on the rear with approaches from each side; also sliding doors and side windows that can be raised or lowered the same as in electric street cars. The cars will be electrically lighted. Seats will be upholstered and the ventilation will be of the best. Each car will be provided with night signs to be distinguished by different colors, to enable passengers to get the proper car. The mechanical construction of these cars is the same as is used by the Coppock Motor Car Co. in the building of commercial trucks, consisting of a two-cycle vertical engine of 35 horsepower, with a special selective type transmission. The engine and accessories will be in front. Delivery of this equipment will be about January 1.



RAPID TRUCK WITH PLATFORM SPRING

FROM the FOUR WINDS

Trinkles Heard From—F. A. Trinkle of this city, who, accompanied by his wife, is driving to San Francisco in a Brush runabout, has been heard from. A letter dated at Ogden, Utah, showed that it took him 13 days to reach that point through rain, snow, sleet and consequently most abominable roads over mountains, gulches and rivers, besides lumpy roads that bore the marks of the flywheel after the car passed over them. However, no mishaps either to any part of the machinery or to the travelers are reported.

Massachusetts A. A. Election—The Massachusetts State A. A. held its annual meeting and election of officers at the Bay State club last Thursday. The officers elected were: A. E. Bliss, of Malden, president; A. D. Converse, of Winchendon, vice-president; J. C. Kerrison, treasurer. No secretary was elected. Secretary James Fortesque declined to be a candidate again. There was talk some months ago of appointing a Worcester man in Mr. Fortesque's place, and this may be done yet. It has been announced that the association proposed to carry on the campaign for sign boards this year and eventually get the highway commission to supervise the work.

Going to Savannah—Going a step beyond what has ever been attempted before locally, the Cleveland Automobile Club, under the direction of W. F. Bonnell, the newly elected president, is trying to organize a special train for the Savannah races. If three Pullman loads can be secured a train will be chartered, including special dining and baggage cars. The members of the party will live in the train the entire 6 days they are away. An effort will be made to interest Detroit, Toledo, Buffalo, Pittsburg and Youngstown in the movement. Other cities are also invited to correspond with Bonnell. It is estimated that outside of meals, the expenses for the 6-day trip will hardly exceed $50.

Jackson in Hard Run—E. P. Blake, manager of the Boston branch of the Jackson company, with Charles G. Percival, reached Bangor, Me., Monday after a strenuous sealed bonnet trip over the road from the factory at Jackson, Mich., in one of the Jackson cars. The two men left the factory October 26 and a wicked rain storm swept along to keep them company. Their route took them through Detroit, Toledo, Cleveland, Buffalo, Erie, Rochester, Syracuse, Albany, New York city, to Boston. On reaching the Hub they started the following day for Bangor, Me. The two men took turns at driving, and sometimes went 24 hours without a stop in order to keep up with schedule.

MOTOR CAR AS BALLOON BASKET

Mr. Blake made the trip as a result of a wager, and the conditions called for an average of 200 miles a day. The car easily filled the requirements.

Buffalo Club Growing — Twenty-five new members recently joined the Automobile Club of Buffalo, the total membership now being 1,501.

Motor Car Men Interested—An important industrial exhibition will be held at Convention hall, Buffalo, December 14-19, under the auspices of the Manufacturers' Club of Buffalo. According to the present plans exhibits will probably be made by the E. R. Thomas Motor Co. and the George N. Pierce Co. The purpose of the show is to advertise Buffalo-made goods.

Hotchkiss Makes Speeches—The value of the motor car in political campaigns has been well indicated in Buffalo. A machine carrying William H. Hotchkiss, president of the American Automobile Association, and other prominent Republican speakers made frequent tours about Buffalo, and the occupants delivered addresses at various points from the car. Accompanying the car was another carrying a party of buglers. The speakers boosted the candidacy of Governor Hughes for re-election.

New Bridge Ready — Members of the Minneapolis Automobile Club have been invited to take part in the opening of the new bridge over Minnehaha creek, which adds an important link in the driving system of boulevards surrounding the city and St. Paul. It is planned to have all the cars parade out to the new bridge, lining up on the bridge in double column and having photographs made. The members of the Soldiers' Home will participate in the ceremonies, the bridge being close to the home.

Real Public Spirit—Public citizens of the town of East Hartford to assist the furtherance of road improvement have loaned their teams for the carting of the necessary material. The volunteer brigade is making things hum and establishes a worthy precedent for surrounding towns somewhat backward in the improvement of its roads. It is believed the example will be followed by others.

Car For Police—The Denver police department has added to its equipment a Stoddard-Dayton runabout to carry four officers. This machine will be kept in front of the station continuously for emergency calls. The city has also placed an order with the same company for a patrol, to take the place of the wagon in use for so many years. This car is being built to order and will go into commission the first of the year. This innovation has aroused general interest in Denver among the business men.

Balloon-Motor Car Ascension—A successful balloon ascension, with a motor car attached in place of the usual basket, was made from Indianapolis last Friday afternoon by Carl G. Fisher, of the Fisher Automobile Co., and G. L. Bumbaugh, of Springfield, Ill. Either because of the fact there was little wind, or because of the weight of the stripped motor car, the distance traveled was only about 10 miles in 1 hour and 50 minutes, when a safe landing was made and Fisher and Bumbaugh returned to the city in the Stoddard-Dayton roadster that had been taken through the sky. The balloon reached an altitude of 2,800 feet and several hundred people followed in motor cars, on bicycles, in carriages and on foot. Every instant the spectators expected to see the motor car come tumbling to the ground, but no accidents occurred. The start at the plant of the Indianapolis Gas Co. was watched by fully 5,000 spectators who would not believe until the last minute that the motor car was to be taken along. The start was to have been made on the north bank of Fall creek, but it was feared the balloon and car would not clear the gas company's building. A crowd of men

volunteered to wade the creek, holding the motor car just above water. The ascension is believed to have been the first of its kind in the world.

Promoter Estey Busy—F. L. Estey, of the Studebaker company, went to Boston after the Vanderbilt race, where he carried out a similar contest between an electric and a gasoline car in that city that was engineered in Philadelphia. It was quite a success.

Long Fall Tour—R. I. Love, Mrs. Cora B. Cole, Charles V. Kirkland and Newell Motsinger arrived in Indianapolis Friday in Mr. Love's Premier six after having traveled about 5,500 miles in a little over 3 weeks' time. During the trip the car was driven over 4,000 miles in and around the Adirondack mountains..

Unique Chalmers Test—The plan of the Chalmers-Detroit Co. to have its agents in 115 different cities start the motors of their new Chalmers-Detroit 30-horsepower demonstrators when the polls opened on election day, Tuesday, was novel. Each agent was required to make a run of 200 miles or more without stopping the motor or making repairs or adjustments of any description.

Diamond's Racing Chief—Announcement is made that the Diamond Rubber Co. will maintain a racing department in charge of which will be Joe Tracy, famous as a driver in big road races and also as a motor car engineer. The Diamond company is of the belief that interest in big racing events is increasing and that the new department is a necessity in order that the company may take care of racing matters on a large scale.

Michigan Busy—The voters of Calhoun county, Michigan, will vote next spring on the proposition of adopting the county road system so that that county may build new roads and share in the state rewards. The board of supervisors of Kent county, Michigan, has appropriated $19,000 for the improving of old roads and the building of new ones in that county next year. The good roads commission asked for $45,000, but this was cut by the supervisors. Last year the county spent $20,000 in improving established roads and building new ones.

Lively Club—The Litchfield County Automobile Club, though a Connecticut organization of recent formation, is up-to-date and is doing things for the furtherance of the sport and industry. Experiments are now in progress for the satisfactory laying of dust. The club uses tar or rather the residue from a gas plant which manufactures water gas. The crude article is said to be so thin that it can easily be distributed by an ordinary watering cart without difficulty. A strong odor like that of illuminating gas is thrown off after the tar is laid but soon passes away. Fine stone is applied after the tar residue has been distributed over the road. This also makes use of the waste product of the gas plant which otherwise would be a burden on the hands of the gas producers.

Hill-Climb Postponed—The New York Automobile Trade Association was compelled to postpone its Fort George hill-climb, which was to have taken place last Tuesday. It was found there was a voting booth on the hill and that a climb would seriously interfere with the election. Another date will be selected.

Jeffery a Philanthropist—Thomas B. Jeffery, president and founder of the big Rambler works at Kenosha, Wis., has again come forward as a philanthropist. He will provide all equipment for the department of domestic economy in the Kenosha high school. He has already equipped the manual training departments.

New York Roads Opened—The new state road from Auburn, N. Y., to Free Bridge, by way of Clark street is now open, so that it is no longer necessary to go through Cayuga. The road between Geneva, N. Y., and Seneca Falls, N. Y., which has been closed all summer for improvement, is now open for traffic. The new state road being built between Avon, N. Y., and Geneseo, N. Y., has been completed only a short distance beyond South Avon. It is reported that the last mile of the road between Buffalo and East Aurora, N. Y., is being macademized and will probably be completed within the next 30 days.

Fuel Test for Denver—The Denver Motor Club has announced that an economy contest will be held Saturday, to be in charge of the contest committee of the club. The route will be from Denver to Greeley and return, a distance of 104 miles. The rules of the A. A. A. will govern. The start will be made at 8 o'clock in the morning; all cars must be at Greeley by noon; leave Greeley at 1. p. m., and check in at Denver by 5 p. m. The entrance fee is $25; all cars starting and going over the route will be refunded $15. A silver cup, donated by Ralph W. Smith, president of the club, will be awarded the car making the highest percentage, and another cup goes to the car making the drive with the least gasoline consumption regardless of weight or percentage.

Pittsburg Garages—There is no place in the country where so many garages are centered in so small a space in the east end of Pittsburg, it is claimed. Baum, Beatty, Whitfield and Mignonette streets and Highland, Penn and Center avenues for a distance of two or three squares from the clubhouse of the Automobile Club of Pittsburg are lined with the cars of big concerns. There are at least fifty large garages within a radius of ½ mile of this clubhouse and practically all the big manufacturers in the country have their agencies in that territory.

Winton Contest Starts—The second annual $2,500 upkeep contest for Winton six chauffeurs opened November 1 and continues to June 30, 1909. Contestants must be employed drivers of Winton sixes, any model, and will be required to file monthly reports of mileage and expenses. At the end of the contest these reports will be passed upon by a committee of disinterested judges, who will award the cash prizes. The chauffeur making the best service record will receive $1,000. Second prize is $500, third $250, fourth $150, fifth to tenth $100 each. No entrance or other fee is charged to enter the Winton test.

Cream City Election—At the annual meeting of the Milwaukee Automobile club, Dr. Louis Fuldner, president; James T. Drought, secretary, and Lee A. Dearholt were re-elected directors. On November 10 the club will meet again to consider the recommendation of increasing the board of directors from nine to fifteen. At this time the old officers will no doubt be re-elected, having given such splendid service for the last few years. The annual report showed the club to be in the most prosperous season of its 6-year history. The treasury contains $1,500, not including $1,200 annual dues to be collected early in January.

E. P. Blake and C. G. Percival in Jackson, Mich.—Bangor, Me., Sealed Bonnet Jackson

ON THE ELIMINATION OF POPPET VALVES

EDITOR'S NOTE—Extracts from a paper read by C. Y. Knight, of Chicago, the inventor of the new Daimler engine, before the Royal Automobile Club on Thursday, October 15, on the Silent Knight Engine, an invention of Mr. Knight's and a brief descrip- of which appeared in Motor Age, Oct. 1, pages 28 and 29.

I HAVE told you we have perfected a motor along new lines. The question now arises, "What advantages over the standard motor have you shown those concerns which have taken up the idea?" In answer to this hypothetical question, I answer:

First — We have demonstrated absolute silence. Not the so-called silence, which is silence by contrast only, but the genuine absence of sound when under load. People who build six-cylinder motors, by increasing the number of cylinders, secure a continuity of noise, which they call silence. I believe I demonstrated to those with whom we have made business arrangements that the silence of this motor is different from the so-called silence of the poppet valve type.

Second—We claim extraordinary smoothness of operation. The sensation of riding in a car propelled by one of these motors is distinctly different from that experienced in a car where eight hammers in the form of valve tappets are continuously pounding away to produce a tremor or vibration which is felt throughout the entire car. As speed increases, the difference between the new type and the old becomes even more marked.

Third — We claim greater flexibility. Given a fly-wheel of average weight, and regardless of compression, one can do almost as he pleases with these motors. From 4 and 5 miles an hour up to 60 without change of gear is not difficult with the standard 38 horsepower. In fact, I may say that only a little slipping of the clutch is necessary to reduce the minimum of this claim to zero, and say from a standstill to 60 miles an hour. In traffic it performs like a steamer. In short, we believe the flexibility of this motor approaches so closely that of steam as to leave very little to be desired. In my own town driving, with a gear of three to one on top and a car capable of 45 miles an hour on the level, about the only times I feel any need of changing gears is when there is necessity for reversing, and I have repeatedly driven from various points of England to the heart of London without change.

Fourth — Reliability. We believe the motor to be as near fool-proof as any piece of power-producing mechanism that has ever been devised. "But what," someone asks, "will happen to this motor if it is not properly lubricated, or if the weather gets cold and your oil is bad and gums up and sticks and you try to start it, or if the water runs out, or in case of a thousand and one possibilities of neglect?"

And in turn I ask, "What would happen to your poppet valve motor if subjected to this same sort of abuse?"

My experience of 8 years driving a motor car—during which I have covered at least 100,000 miles of all kinds of roads in many countries—and my 5 years' experience in the motor and car manufacturing business have put me in a position to know the shortcomings of the other type of motor. I can cite authorities upon the care of motor cars which devote pages to a recital of what may happen to valves alone, and further space to suggestions for their care. And this is not surprising when you realize that, outside of nuts, bolts, and cotter-pins, fully one-fourth of the number of parts required to assemble a poppet valve-motor comprise the valve system.

Fifth—We claim greater fuel efficiency under normal conditions than that of the Otto type. Upon the bench we produce one horsepower for an hour with from .54 to .64 pint of gasoline, according to compression pressure.

Sixth—We claim much greater working endurance. The tendency to lose power upon the brake under continuous load, which is so frequently the case with the other type of motors in time, is not characteristic of this motor. There are no valves or valve seats to warp, heat, or break, or springs to weaken under continuous heavy work. One of our 114 by 140 mm. motors under test in a continental establishment has been under full load upon an electric brake 9 hours a day for more than 50 days at speeds ranging from 800 to 1,650 revolutions per minute, and it is as steady under power as a clock, never varying in power or speed from the opening of the day until its close.

Seventh — We claim great power and speed. In the matter of power this motor will give the purchaser anything within reason he can desire. The Daimler company has settled upon a compression which gives slightly over 57 horsepower at 1,200 for the 38 horsepower on R. A. C. formula. This motor is capable of being accelerated up to 2,500 or throttled to less than 150. If the purchaser should desire a motor with a little more "ginger" in it, it is a matter of less than an hour to substitute heads which will very materially increase his power, but this would be beyond the limits recommended by the company for the accompanying chassis. Up to 100 pounds gauge compression the motor is as silent and flexible as at 75 pounds. The only disadvantage we have found in the high compression is the possible necessity of more frequent cleaning of the carbon from the piston heads and combustion chamber. But this, with our construction, is a job of not over an hour for four cylinders. On the other hand, should a customer conclude he did not care for a motor developing the power the 38 horsepower gives at 1,200, we can fix him up with heads which give increased volume of the explosion chamber and less power, but decreased fuel efficiency.

We have driven motors of this type with compression ranging from 45 to 95 pounds, and tested them upon the bench to as high as 114 pounds gauge. We have come to the conclusion that for the general public which wants a car with "ginger" in it the 75 pounds compression is about right. With this compression a fairly intelligent driver should easily do 20 miles to the gallon of gasoline and run 450 miles to the gallon of lubricating oil.

Very few of the rank and file who operate cars realize the relation between compression and smooth running. The nature of the work of the mushroom valve is such that the moment it commences operation it starts to go wrong. I do not imply that it goes at once, but if it does not do so ultimately it is a different valve from any I have ever had any experience with. On the other hand, the longer the segment rings employed by the new Daimler motor wear, the more perfect their fit and the tighter the cylinder. As the travel of the sleeve is but one-twelfth of the piston, it is evident that deterioration of such parts cannot be great. In fact, a whole season's wear is almost too infinitesimal for measurement.

As a result of this stability we know no such thing as loss of compression in the new motor unless through breakage of rings in the piston. In America three full seasons in the hands of the public have not brought to light a single instance of such trouble. When a valve motor begins firing irregularly, and you find the ignition system in good order, you naturally turn to the carbureter. You conclude the misfire is due to improper mixture. You give the motor more or less fuel—generally more—and the difficulty appears to have been remedied. If you have enriched the mixture, you have coaxed one cylinder to fire better and weakened the other three, so that none is giving the power it should. Nine chances in ten the difficulty was not with the carbureter, which, if right when finally adjusted at the factory, is still so. The trouble is that compression in the faulty cylinder is lower than that in the other three, and lower compression requires a richer mixture for ignition.

Every designer of multiple internal-combustion motors understands that smooth running depends upon perfect explosive as well as mechanical balance, and not over-heavy reciprocating parts. Proper explosive balance cannot be acquired except with even compression pressures throughout the various cylinders.

In the new motor every inch of the surface of the explosion chamber is machined to dimension. This makes explosive bal-

ance a certainty. These machined and polished walls have also the advantage of presenting no projecting particles upon which carbon can burn and prematurely fire the charge.

In the matter of gas passages, this design affords an almost unlimited choice of capacity. We can, if desired, make the openings equal to the area of the entire bore of the cylinder. It is merely a matter of eccentric stroke. We have, therefore, no problems in the filling and scavenging of our cylinders.

The bulk of criticism of this motor appears to be directed at lubrication. Our critics get an idea that we are depending upon perfect fit of these sleeves to hold compression. The fit between the two sleeves and their relation to the water-jacketed cylinder bear no relation whatever to compression. We have successfully operated these motors with sufficient clearance between the sleeves to permit the introduction of a thin sheet of cardboard. I do not mention this as good practice, only to illustrate to what extent we can go in neglecting this fit. Upon the other hand, we have tested upon the block and run upon the road for hundreds of miles motors which these sleeves are a "dead" fit. We do not regard the latter to be good practice either. Such experiments have been necessary to ascertain our limitations.

Compression, so far as the ports are concerned, is held solely by the wide ring at the bottom of the head, from inside the cylinder. The spring ring beneath holds the segments comprising the ring against the inner sleeve, and prevents the escape of any gas after the ports have passed behind it. Here in the matter of holding compression we have an advantage which no poppet valve can ever possess; there is always a film of oil between the seat of this segment and the surface of the sleeve to seal the joint, because both sliding surfaces can be kept cool enough for lubrication, while the surfaces of metal depended upon in connection with the poppet valve to hold compression can never be lubricated, and the tendency of the poppet valve therefore is to become less efficient as used.

Upon the other hand, with the ring construction of the so-called valveless motor we have exactly the reverse. Its function is similar to that of the piston ring. These rings — compression-holding segments we call them—are made up in quantities with no special care whatever. No more attention is paid to their finish or fitting than is given the construction and application of the piston rings. The motors are taken directly from the erecting shop to the test shop, and started under their own power as if they had run for weeks instead of being newly assembled. The timing of the ports is controlled by eccentrics, which are turned integral with the shaft with a mathematical precision which is too simple a proposition to permit of errors. Improper timing of port openings and closings is not possible after the motor leaves the shop, as it would be very difficult for the operator to tinker with this vitally important function, and it never needs adjustment. There is no bearing surface which can possibly wear sufficiently to upset the synchronism.

One inquirer desires to know what is going to happen to the sleeves on the side where the actuating lugs project. He expresses the opinion that the repeated impact of the reciprocating motion must in time cause the latter to break. The eccentric shaft which actuates the sleeves travels at half speed of the mainshaft. The inner sleeve weighs 10 pounds and the outer 6 on the 38. Their travel is 1 inch. When the motor is turning 1,200 revolutions per minute, these sleeves are travelling at the rate of 1,200 inches, or 100 feet per minute. The pull upon the pin of the inner sleeve at the top of the stroke is 62 pounds, and at the bottom—because of the slower travel as a result of the connecting rod's different angularity—the force is 40 pounds. On the outer sleeve the impact at the top is 34 pounds, and on the bottom 26 pounds. The pull of the two sleeves combined upon the eccentric shaft is 76 pounds upward and 60 pounds downward. Compare these pressures with the tons of impact of the explosion upon the gudgeon pin in the piston of any motor, or the strain upon the lugs which hold the cylinders to the base.

Another point which is almost invariably raised is "How about the wear?" Now wear is the result of friction between surfaces. We know exactly how to provide for it. We design our bearings with surfaces the extent of which are based upon the pressure under which they work. These sleeves are of cast-iron. Their bearing surfaces work under the very best conditions. No combination of metals has ever yet been produced which stands friction under heat as well as cast-iron against cast-iron. The area of that portion of these sleeves which receives the lateral pressure of the piston upon its power stroke is 45 square inches. The greatest pressure occurs when the crankshaft has turned about 30 degrees on its outward explosion stroke. At this point, basing our calculations upon a maximum initial pressure of 25 atmospheres at ignition, we find a side thrust of 900 pounds. Divide this into the 45 inches, and we have a momentary pressure of 20 pounds to the square inch. The piston produces this pressure with less than one-third of the wearing surface, making 60 pounds to the inch for that member; hence these sleeves are working under only one-third the pressure of the piston, and at only one-tenth its speed.

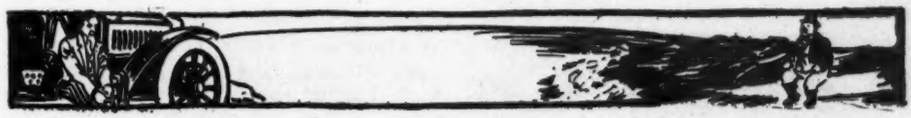
A doubtful point which has been raised is in connection with the amount of power absorbed through friction in the operation of these sleeves. This doubt is not dispelled until the motions of the reciprocating parts are analyzed in all details and at all positions.

If any abnormal absorption of power in operating the sleeves existed, it would undoubtedly take place when the piston exerts its greatest lateral pressure upon the cylinder wall.

Taking the coefficient of one as the percentage required to move in a plane one properly lubricated surface over another, the amount of a pull for a very short proportion of the stroke would figure 90 pounds at half-inch radius on the eccentric shaft. But note that when the piston is pressing hardest against these sleeves, it is traveling downward upon its power stroke, and the sleeves are traveling in the same direction. Instead of the piston thrust causing the sleeves to resist the effort of the shaft to pull them, they are, in fact, following it, actuated by this friction, which would, but for their downward movement, be absorbed by the cylinder walls. The sleeves travel against the piston upon its upward scavenging stroke, but at this time there is no side pressure of consequence, therefore no undue absorption of power. The same is true of the suction stroke, where again the motions are in opposite directions. But at the time of compression, where resistance of the charge forces the piston in its upward or inward travel against the cylinder walls, all these moving parts are traveling in the same direction. We may cite results which show upon the dynamo the power absorption to be below normal for petrol motors, working out about 13 per cent, showing a mechanical efficiency of 87 per cent.

I could talk to you all night regarding the advantages of a sperical combustion chamber, proper position of spark plugs, advantages of direct ingress of the charge and egress of the exhaust, but I have only to call your attention to these features, I believe, to have them appreciated. The motor is certainly most easily cooled. The circulating water scarcely becomes warm enough for best fuel efficiency. Ports of large area clear the cylinders of hot gases so rapidly that there is a minimum of internal heat.

I am frequently asked to what feature of design I attribute the motor's great flexibility. I am unable to find but one explanation, and that is the shape of the explosion chamber. Gas fired in a chamber free from corners and pockets, with all surface reduced to a minimum in proportion to its volume, naturally retains its heat and pressure a greater length of time



than if the explosion chamber were angular. In order, therefore, to obtain that steam-like flexibility which pulls steadily at slow speeds, a spherical explosion chamber is necessary, and the less wall surface in proportion to volume, the greater the range of speeds, all other conditions being equal.

Undoubtedly the position of the spark plug has considerable to do with flexibility. It is an easy matter to so place the plug that it will not readily fire the charge. Fresh gas is necessary for pure ignition, and any eddies or strata about the plug mean uncertain firing, wasteful operation, and an overheated motor.

In the early designs of our motor we placed the spark plug in the center of the dome of the cylinder head, some distance above the inlet port, the dome being very high. We found that without some means for deflecting the gases upward ignition was uncertain and the motor noisy, hot, and wasteful of fuel. We have eliminated this trouble by the use of a lower dome and concave piston.

The surprise in the operation of this motor lies in the fact that, instead of being more difficult to cool than the standard type, it possesses a remarkable standing up quality. The tests to which this motor have been subjected are of a character hitherto unheard of in high speed practice. One of our 114 by 140 millimeter motors has been under constant load for 50 days to an extent which if employed driving a touring car would have traveled with its full load up a 7 per cent grade for 14,850 miles at the rate of 33 miles per hour. But it should be understood that the bench test is much more severe than even pulling up grade. Our motors under test invariably gain power for the first hour. An example is in a test started at 55 horsepower at 1,140 per minute, which finished the hour at 56.8 horsepower at 1,180, no change having been made in throttle, spark, control, or load. Pre-ignition is unknown unless in case of extremely foul piston head, in which case conditions are not different from those in any other motor, except in our case it is the matter of less than an hour's time to remove the cause, whereas with the poppet valve type it means the dismounting of the cylinders.

There has been considerable criticism of various details of construction which, strange enough, have in practice worked to perfection. The actuating of these sleeves from one side has been referred to as unmechanical. The fault is fancied, not real. The bearing surfaces are too great and the sleeves too long to permit any binding or cramping to occur.

So far as injury of the ports by burning is concerned, all I can say is that they do not burn. In this motor the ports are never exposed to the extreme heat of the initial explosion. This high temperature never reaches them, but at the time of the explosion they are between two walls of water, from between which they do not emerge until the heat and pressure have been reduced by the expansion of the gases as the piston travels down on the power stroke. There is no other known instance where a port in an internal combustion motor performs its functions and then, so to speak, disappears out of range and dissipates its heat preparatory to the next operation. It is this combination and movement which makes possible the success of the motor. Were these ports continuously subjected to the high temperatures of the initial explosion, lubrication might be out of the question, and the collection of carbon upon their lips would unquestionably result in disastrous pre-ignition, and possible pitting of their surfaces.

So far as cooling the sleeves is concerned, the reciprocating motion appears to exert a wonderfully beneficial influence. Doubtless two films of oil between the piston and the water jacket might act as an obstruction to the dissipation of heat were the sleeves at a standstill and the oil undisturbed. But the constant rubbing together of the sleeve surfaces is an ideal operation for transferring heat from one to the other, and in turn to the water jacket.

Outside of the ability of the cylinder to receive and discharge without restriction its gases up to any reasonable speed sought by the designer comes the question of distortion of metals under heat. Experience convinces us that a very large percentage of the so-called failures of lubrication are not lubrication failures at all, but the result of tremendous heat. It is distortion which causes failure of lubrication.

My conclusions in this respect are drawn from by observation of the behavior of hundreds of motors under test. The minute a motor with uneven thickness of cylinder walls becomes highly heated, the metal goes out of round to the extent of several thousandths of an inch. These gases either blow or burn out the lubricating oil and cause further heat and distortion, which in case of continued hard work ultimately cause seizure of the piston and the destruction of some part. Distorting cylinder walls also let heat which should go to the exhaust into the motor base, and endangers the life of the bearings.

In the water jacket cylinder which carries the ports we cannot, however, have much uniformity, and this cylinder is subject to distortion. But as we do not depend upon this member to hold compression, the piston not coming in contact with it at all, it is a simple matter to make allowance for such irregularities.

After a new motor has been "run in" for a few hours under its own power, the brake is put on and it is brought up to about three-quarters load. It is run under these conditions until thoroughly heated, in order that the outer cylinder or water jacket may go out of shape to the extreme limit. The motor is then taken down, and it is found, as a matter of course, that every point of distortion is marked upon its walls by the outer sleeve through friction marks. The cylinder is then treated as we treat a bearing which is being fitted, the high spots being scraped away. It is a very short job, and when all four cylinders are so scraped the motor is reassembled for doing its full power. The test then proceeds, and after the motor has received the "O. K." of the superintendent it is again taken down and inspected prior to its being sent away to its chassis. If after the scraping-in that it has previously undergone high spots still manifest themselves, these faces are again scraped.

By taking away these high spots we prevent high spots on the outer jacket pressing against the sleeves, and in turn causing the latter to pinch the piston. The piston never requires relieving upon any side unless it chances to be too large, and I may say we practically find it necessary to touch up the rings.

You ask, "Why cannot this process be applied to all motors?" The answer is that you dare not scrape the wall surface where the piston travels. To do so would cause a gas leak around your rings, because under various degrees of heat the cylinder distortion is never the same, and there is no knowing what shape is needed cold to get roundness under heat. In the case of our cylinder and sleeves, a clearance of a few thousandths of an inch between the outer sleeve and water jacket cuts no figure whatever. We can do a very rough job of this scraping-in without any fear of loss of compression or blow-by, because there are no gases between those surfaces to trouble us.

The public will probably be surprised at the appearance of a six-cylinder Daimler under test upon the roads inside a few weeks. The first lot is to go to America on an export order, and I fear it will be some time before these will be placed upon the market upon this side. Frankly, I fail to see where the six can be any smoother or more flexible than our four, but I have some friends across the water who think they want sixes because they have used sixes several years.

It will probably have been observed that I have had nothing to say concerning weight. Employing the same weight flywheel used on the 1908 Daimler, the 38-horsepower valveless came out about 12 per cent lighter. Then the unexpected development of about 10 per cent more power necessitated some strengthening of parts, particularly in the cylinders and motor base, which added about 15 pounds, leaving the construction from 8 to 10 per cent lighter.

Brief Business Announcements

San Francisco, Cal.—The General Motor Car Co. has been declared an involuntary bankrupt.

Trenton, N. J.—The United Automobile Dealers' Association has been incorporated with a capital stock of $20,000.

Harrisburg, Pa.—The Mutual Motor Car Co., of Pittsburg, has been incorporated with a capital stock of $10,000.

Boston, Mass.—Fred H. Ayres has been appointed manager of the local branch of the Fisk Rubber Co. to succeed George A. Campbell.

Lansing, Mich.—The Oakland Motor Car Co., of Pontiac, has filed a certificate increasing the capital stock from $200,000 to $300,000.

Kansas City, Mo.—Lewis W. Robinson, who has been appointed agent for the Franklin in this city, has incorporated his company.

Bordentown, N. J.—W. T. DeWorth & Son are to erect a garage on Miles avenue, which will accommodate more than twenty-five cars.

Mesa City, Ariz.—E. S. Stafford, of Montana, is to open a garage here, and already has secured space in the Crimson property for his headquarters.

New York—The Moon Motor Car Co. has removed from its former location at Seventy-ninth street and Broadway, and is now located at 1761 Broadway.

Philadelphia, Pa.—Harry De Groat has severed his connection with the Rambler and in the future will be on the staff of the Studebaker company.

Akron, O.—The Osborn Engineering Co., of Cleveland, has prepared plans for the erection of a five-story factory building for the Goodyear Tire and Rubber Co.

Albany, N. Y.—The Jones Speedometer, of New Rochelle, has been incorporated with a capital stock of $100,000, and will manufacture instruments, tools, machinery, etc., it is stated.

Allentown, Pa.—The Dietrich Motor Car Co., of 24 North Tenth street, has concluded an arrangement with the Franklin company whereby it is to act as agent for the Franklin cars.

Birmingham, Ala.—The Automobile Livery Service Co. has made application for a charter. The new concern has a capital stock of $5,000, and will deal in motor cars as well as doing a general transfer business.

New York—The George J. Scott Co. has given up the agency for the Jackson in this city, and in the future C. W. Oathout will represent this machine. He will continue the headquarters at 1729 Broadway. Mr. Oathout has represented this car in New Jersey for several years, and for the past year acted as eastern sales manager for the Jackson Automobile Co.

Columbus, O.—The Auto Purchasing and Exchange Co., of Cleveland, has been incorporated with a capital stock of $10,000 by local people.

Boston, Mass.—The Hol-Tan Co. has decided to open a local salesroom for the Lancia car, and has secured quarters at 66 Hereford street. W. M. Hilliard has been appointed manager.

Detroit, Mich.—The Auto Express Co. has installed two Oldsmobile taxicabs. One will be placed between the Metropole and Pontchartrain and the other at the Auto Express Co.

Huntington Ind.—J. C. Curtis, general manager of the C. B. and Q. railroad, is about to apply to the city council for a franchise to run a motor car transit system on the city streets.

Pittsburg, Pa.—The Standard Automobile Co., of 5917 Baum street, has just concluded arrangements with the Franklin Motor Car Co. to represent the Franklin in this city during the coming season.

Los Angeles, Cal.—R. J. Leavitt, the agent for the Locomobile in southern California, has taken over the garage of the Success Automobile Co., at Pico and Hill streets, and will make it his headquarters.

Los Angeles, Cal.—The A. W. Gump Automobile Co., is making preparations to give up the retail agency for the Jackson, and will start in business as the distributer for that machine on the Pacific coast.

Jersey City, N. J.—International Taximeter Motor Cab Co., capital stock $250,000; to conduct a taximeter cab business.

Troy, N. Y.—Hygrade Rubber Bicycle and Automobile Supply Co., capital stock $10,000; to manufacture rubber goods of all kinds.

Indianapolis, Ind.—Best Automobile Co., capital stock $20,000; to deal in motor cars.

Homestead, Pa.—Triumph Automobile Tire Co., capital stock $1,000,000; to manufacture a new tire of solid construction. The company has also taken out a charter in West Virginia.

Alexandria, Va.—Retailers' Transfer Co., capital stock $1,000 to $100,000; to engage in the motor car business. R. W. Nichols is the president of the company, M. A. Keane secretary and S. W. Meek vice-president, all of Washington, D. C.

Boston, Mass.—G. H. Pixley Co., capital stock $50,000; to engage in a general motor car business.

Syracuse, N. Y.—Champion Tire Co., capital stock $100,000; to manufacture tires for vehicles of all kinds.

Beloit, Wis.—E Z Auto Gocart Co., capital $25,000. Incorporators, Frederick Kaplan, Abraham Kaplan and A. Knells.

Bridgeport, Conn.—Astor Motor Car Co., capital $10,000, to manufacture and deal in motor cars.

Albany, N. Y.—Albany Motor Car Co., capital stock $5,000; to deal in motor cars.

The Elmore agency, of which D. B. Rose is manager, is making arrangements to remove to the new garage on Olive street.

Mooreland, Ind.—The Stanley Automobile Co., of this town, has completed the arrangements which have been going on for sometime and will remove the plant to Troy, O.

Buffalo, N. Y.—A fire in the warerooms of the Buffalo Auto-Body and Trimming Co. last week did more than $6,000 worth of damage, all of which is covered by insurance.

Albany, N. Y.—The Walton Motor Co., Nassau county, has filed a certificate to the effect that one-half of its capital stock, which amounts to $10,000, has been paid in by the stockholders.

Pittsburg, Pa.—Parke C. and Roland G. Wood have formed a partnership and will go into business as agents for the American roadster. They have already opened headquarters on Wood stret.

Kansas City, Mo.—Charles Dinklage, formerly with the Kaw Valley Automobile Co., has been appointed manager of the Pioneer Motor Car Co., of 3028 Gillham road. This company has the agency for the Apperson.

Pittsburg, Pa.—The Mutual Motor Car Co. has bought the garage of the Colonial Automobile Co. on Walnut street. The company is to be run on a unique basis, as the use of the garage will be restricted to the stockholders owning it.

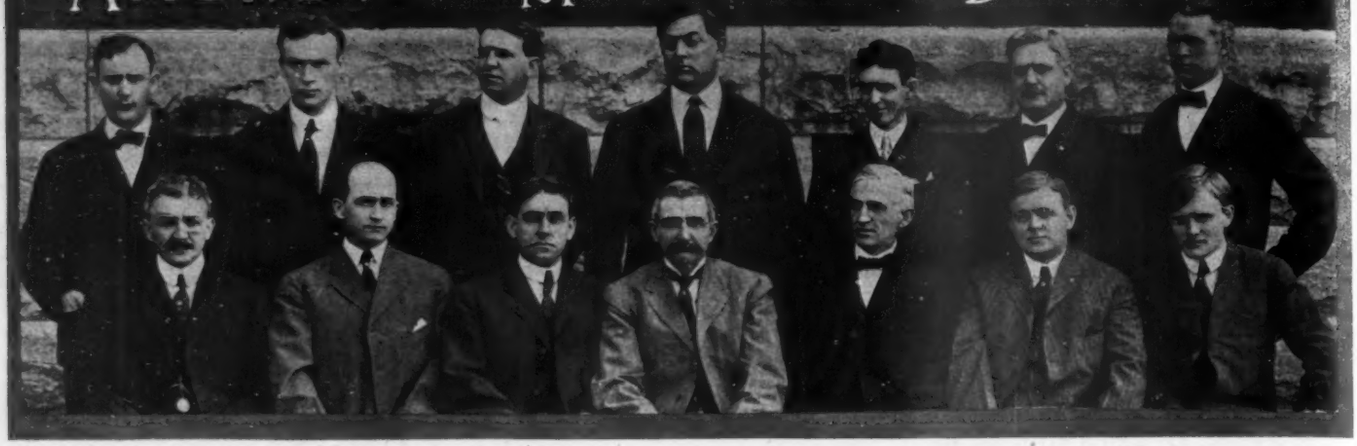
Rock Island, Ill.—The Meter Maxwell Auto Co., of 208-210 West Third street, has been sold to P. C. Peterson, and in the future will be known as the Peterson Co. This company is the agent in Iowa and western Illinois for the Pope-Hartford.

Lake View, Ore.—A motor bus line has been started between this town and Likely, Cal. This latter place is the terminus of the N. C. O. railroad. Round trips will be made three times a week, and the old stage line will continue to run as in the past.

Los Angeles, Cal.—W. R. Reuss has made arrangements to take the agency for the Pope-Hartford. He has taken quarters at 1028-33 South Main street, and will fit up garage and salesroom as well as machine and repair shops. Franklin C. Holmes is to be associated with Mr. Reuss.

San Francisco, Cal.—A new taxicab company has been formed here with F. C. Beals as president and manager; G. P. Fuller, vice-president; L. W. Haller, secretary, and F. P. Hooper treasurer. The concern is being financed by E. H. Rollins & Co., and will have a capital stock of $300,000.

AMONG the MAKERS and DEALERS



SALESMEN AND OFFICERS OF THE NEW WAVERLEY COMPANY

Bottom row, reading from left to right—H. W. Goodman, Charles M. McAlpin, purchasing agent; Herbert H. Rice, vice-president and manager; Carl von Hake, treasurer; William P. Cooley, president; Wilbur C. Johnson, secretary; Roy A. Potts, sales manager. Top row from left to right—E. K. Shugert, R. T. Davis, P. W. Elgner, K. W. Brewer; H. W. Dickerman, E. R. Vincent, W. S. Gilbreath.

Roper Sales Manager—John E. Roper has been appointed sales manager of the Model Automobile Co., of Peru, Ind.

Githens Sales Managers—Herbert A. Githens, who for many years has been general traveling representative of the G & J Tire Co., has been advanced to general sales manager.

Rayfields Move—Rayfield & Rayfield have moved from 6523 Wentworth avenue to larger quarters at 2228 Michigan avenue, Chicago, where they will continue to repair and overhaul motor cars and make special parts.

Rambler Branch Discontinued—Thomas B. Jeffery & Co., it is announced, have decided to give up their Philadelphia branch and concentrate their eastern distributing business in New York city. The Tioga Automobile Co. will act as Philadelphia agent, with George C. Brownlee as manager.

St. Louis Firm Reorganizes—J. H. Neustadt, founder of the Neustadt Automobile and Supply Co., St. Louis, Mo., having disposed of his entire interest in the business and retired, a reorganization of the firm has been made. New officers elected were: H. L. Epperson, president and treasurer; F. J. Tecklenberg, vice-president, and H. W. Gray, secretary and general manager.

Fanning's New Move—Frank J. Fanning, at one time sales manager for the Haynes and later of the Levy & Fanning company, of Chicago, has been appointed assistant sales manager of the Chalmers-Detroit company. He will take up his duties at the factory at once. Mr. Fanning also will continue his Chalmers-Detroit agency in Indianapolis, with John Haynes in charge, retaining his present location on Massachusetts avenue until December 1, when the agency will be removed to 11 West Market street. Fanning also has secured the Pierce-Arrow agency, which will be handled in conjunction with the Chalmers-Detroit.

Will Handle Empires—The Empire Automobile Tire Co., Trenton, N. J., has arranged with the Consumers' Auto Supply So., Seventh avenue and Smithfield street, Pittsburg, Pa., to handle its tires for the coming season.

Benjamin a Dealer Now—C. Arthur Benjamin, at one time sales manager of the Franklin and later general manager of the Aerocar company, has become a dealer at Syracuse, N. Y., his old home, where he is handlIng the Packard and E-M-F motor cars.

Dealers Remembered—C. F. Jensen, president of the National Retail Automobile Dealers' Association, announces that the promoters of the Grand Central palace show in New York have given the association space at the exhibition, and in addition will give every dealer presenting his card a pass for the week.

Brush Extends Territory—The Brush Runabout Co., of Detroit, Mich., has in the past week completed negotiations for representation in Kansas, Oklahoma, and western Missouri under supervision of H. G. Kirkland, with main office at Kansas City, Mo. The firm will transact business under the name of Brush-Overland Motor Car Co.

Beyfuss Remarries—A. E. Beyfuss, western publicity manager for the White company, is married again. The ceremony took place at St. Mary's Episcopal church, in Kansas City, Mo. However, Miss Kittie Louise Perrin was already Mrs. Beyfuss, for the marriage ceremony had been performed by a justice of the peace in San Francisco. Mrs. Beyfuss and her parents were in Kansas City and it was decided to have another ceremony, so a license was procured. Mr. and Mrs. Beyfuss have gone on a tour of the Texas and California race circuits.

Leinbach In Charge—The Olds Motor Works, of Lansing, Mich., has opened up a factory branch in Baltimore with temporary headquarters at 406 American building. The branch is under the management of E. L. Leinbach.

Takes Lamp Line—The selling agency to manufacturers for the line of lamps and generators made by the Twentieth Century Mfg. Co. has been taken by the Stevens-Britton-Maurel Co., of 1783 Broadway, New York city, which will hereafter handle all business with makers and importers.

New Pump Agents—Distributers for the Spencer power air pump have been appointed as follows: The American Motor Car Co., 187 Wisconsin street, Milwaukee, Wis.; George W. Edge, 3924 Olive street, St. Louis, Mo., and the Neustadt Automobile and Supply Co., 458 Golden Gate avenue, San Francisco.

Concession to Mitchell—Because the Mitchell Motor Car Co., of Racine, threatened to drop its plan for spending $100,000 for new buildings if the city made Packard avenue a 30-foot street, taking 3 feet of Mitchell ground, worth to it the weight in gold almost, the street is to be only 26 feet wide.

Olds Branch in Pittsburg—The Olds Motor Works of Lansing, Mich., has established a factory branch in Pittsburg under the management of J. V. Hall, who was formerly Oldsmobile salesman for the state of Ohio. Commodious quarters have been secured at 5922-5924 Baum street. It is planned to make Pittsburg the distributing point for all Olds cars sold in western Pennsylvania, the state of West Virginia and all the northwestern portion of the state of Maryland. This includes some thirty sub-agencies, which hereto-

fore have been handled through dealers. The agents will now handle the Oldsmobile line as a direct agency proposition.

Garage at Brazil, Ind.—H. Richter has established a garage at Brazil, Ind., his building being 60 by 80 feet.

Takes the Buick—The Buick, which was formerly handled in Hartford, Conn., by the Miner Garage Co., will hereafter be sold by the Capitol City Automobile Co., present agent for the Mitchell.

Nadall's First Agent—The first agency appointed for the Nadall demountable rim, made in Chicago, has been placed at Minneapolis, where O. Fenstermacher has been named. The Canadian Rubber Co., of Montreal, is now considering taking Canada for the rim.

Pennsylvania Changes—Hereafter Pennsylvania tires will be sold in Cleveland by the Pennsylvania Rubber and Supply Co. under the management of J. C. McLean, of the Lake Avenue Auto Co. Former Branch Manager Moody has been put in charge of the Chicago branch. M. J. O'Connor, formerly assistant manager of this branch has also gone to Chicago with Manager Moody.

Big Tire Order—To the Ajax-Grieb Rubber Co. has been awarded an order for tires which provides for 29,000 tires costing over half a million dollars, to be delivered before July 1, 1909, to the Maxwell-Briscoe Motor Co., whose factories are at Tarrytown, N. Y.; Newcastle, Ind., and Pawtucket, R. I. These tires, numbering 7,250 sets, are to be used as standard equipment on the Maxwell line for next year, it is announced.

Fisk Tire Changes—George Campbell, manager of the Boston branch of the Fisk tire for a number of years, has been appointed to a position with the factory forces as traveling sales agent. Fred H. Ayers, who has been with Mr. Campbell for 5 years, has been appointed manager of the Boston branch. Harry Howlett, who was formerly with the Diamond company, has also joined the Boston office to assist Mr. Ayers.

Pope Plans Maturing—According to the statement given out by A. L. Pope, one of the receivers of the Pope Mfg. Co., the plan of reorganization of the company is now but a matter of a short time until the matter can be put through the various courts. The plan of reorganization includes the deposit of first and second preferred stock and the issue of $800,000 of notes. About 98 per cent of the first preferred stock and approximately 90 per cent of the second preferred stock has been deposited with the reorganization committee. Of the notes needed a large part already has been subscribed by the stockholders. The total debts of the company were about $1,700,000, of which 75 per cent has been paid out of the profits of the past year and by the sale of various properties not used by the company. The profits of the Hartford and Westfield factories during the past year amount to about $400,000.

Gray & Davis in New York—Gray & Davis, makers of lamps, have opened a branch in New York city at 377 Broadway, William H. Gray being in charge.

Will Start at Green Bay—The Gotfredson Brothers Co. will open a garage and salesroom at Green Bay, Wis., the first of the year, its plant being located on Jefferson street. The line of cars to be handled has not as yet been selected.

Bauer Austin Recruit—Charles H. Bauer has resigned from the Studebaker company to assume the sales management of the Austin Automobile Co., of Grand Rapids, Mich. Mr. Bauer was with the Electric Vehicle Co. for several years previous to his connection with the Studebaker company.

Holtan Branch in Boston—The Holtan company has opened its branch in Boston. Harry Fosdick, a former Bostonian, but now with the New York office, has had built a store on Hereford street, near Boylston, which is in the heart of the motor section, and it was turned over to him last week. William Hilliard has been appointed manager of the Boston office.

Waverley People Meet—The regular annual conference of salesmen and officers of the Waverley department of the Pope Motor Car Co., has been a feature of the Indianapolis factory. The most successful ever held, however, was the one just closed, where the new and the old combined in united effort to dig out all of the points regarding the Waverley electric carriage.

Bendix at Logansport—Offices have been opened in Logansport, Ind., by the Bendix Automobile Co., of Chicago, the company having completed plans for the removal of its plant to the Indiana City. Included in the terms of the removal was a promise to take $75,000 worth of capital stock by Logansport people. All but $3,500 of this amount has been subscribed and arrangements will be made at once for a plant. About 500 people will be employed by the company after January 1.

Kiblinger Expansion—The W. H. Kiblinger Co., of Auburn, Ind., maker of motor buggies, is spending $20,000 enlarging its plant, which will permit it to turn out twenty-five cars a day, an increase of fifteen. The company has just opened a Canadian branch at Orillia, Ont., under the name of the Tudhope-McIntyre Co., and also has established an eastern office at 256 Broadway, New York city, under the management of H. H. Woodrough, who will handle the New England states, New York, Pennsylvania and some of the eastern states. James H. Griffith will run the branch at Kansas City, his territory including Kansas, western Missouri, Nebraska, Oklahoma, Arkansas and Texas. Oliver J. Prentice, formerly of the Long-Critchfield Corporation, of Chicago, has assumed the position of sales manager of the Kiblinger company.

Firestone Branch Moves—The Boston Firestone branch has been moved from 9 Park square to 145 Columbus avenue.

Moves to Detroit—P. S. Steenstrup, secretary and general manager of the Hyatt Roller Bearing Co., whose works are located at Newark, N. J., has moved his residence to Detroit and will maintain offices in the Majestic building in that city from now on.

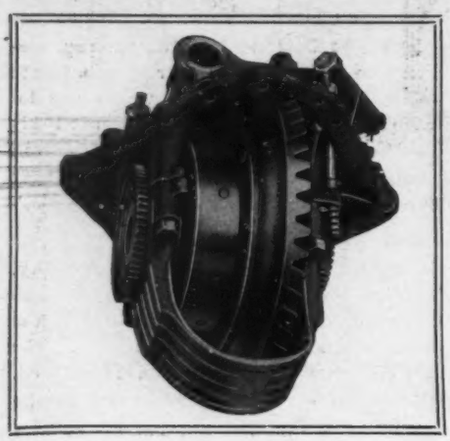
Buys Out Powellson—H. G. Kirkland, of the Jackson Motor Co., of Kansas City, Mo., has bought out the interest of John Powellson and will hereafter handle the Overland and the Brush exclusively. The new firm name has not been announced. It is understood that Powellson will handle the Jackson. He has not named his new location.

Another Motor Buggy Maker—Arrangements are being made by the Cole Carriage Co., of Indianapolis, to bring out a line of motor buggies and surreys next season from a design made especially for the company. A trial test car has been brought out but the details of its construction have not been made public. This will make the seventeenth Indiana concern to manufacture motor buggies.

Oakland Activity—By the erection of a test house and storage building within the next 60 days the Oakland Motor Car Co. will increase its capacity to such an extent that the management hopes to be able to turn out 1,500 cars for the 1909 season, work having been already begun. J. H. Whitney has been awarded the contract for the building and must complete the work within 60 days. The building will be of brick and cement construction, 60 by 112 feet and two stories high.

Credit Body Growing—New members of the Automobile Trade Credit Association as are follows: Ajax-Grieb Rubber Co., New York; Automobile Improvement Co., Chicago; E. M. Benford, Mt. Vernon, N. Y.; Bi-Motor Equipment Co., Boston, Mass.; Albert Champion Co., Boston, Mass.; Chicago Battery Co., of Chicago; Cincinnati Ball Crank Co., Cincinnati, O.; William Cramp & Sons Ship and Engine Building Co., Philadelphia; William H. Crane Co., New York; Firestone Tire and Rubber Co., Akron, O.; Manhattan Electrical Supply Co., New York and Chicago; C. A. Mezger, New York; A. R. Mosler Co., New York; Nathan Novelty Mfg. Co., New York; Rajah Auto Supply Co., Bloomfield, N. J.; Royal Equipment Co., Bridgeport, Conn.; Rushmore Dynamo Works, Plainfield, N. J.; F. W. Spacke Machine Co., Indianapolis, Ind.; Stevens-Duryea Co., Chicopee Falls, Mass.; Universal Electric Storage Battery Co., Chicago; Western Electric Co., Chicago; Wheeler & Schebler, Indianapolis, Ind.; Worcester Pressed Steel Co., Worcester, Mass.

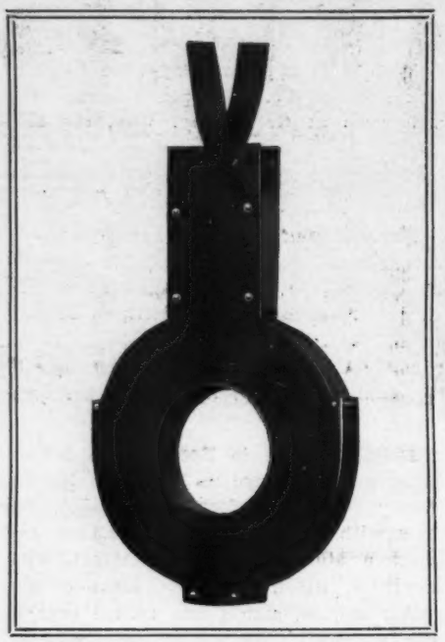
Development Briefs



TIMKEN DIFFERENTIAL CARRIER

K-W INDUCTOR MAGNETO

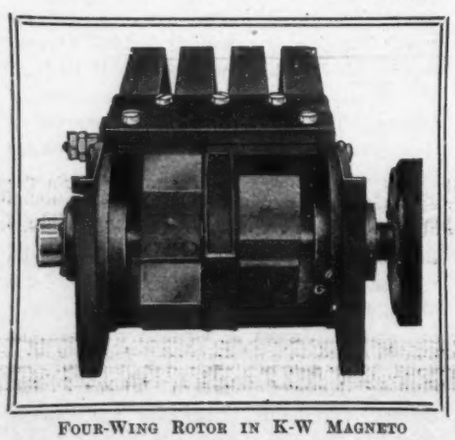
The K-W Ignition Co., Cleveland, O., will manufacture for next year its K-W inductor magneto, which has been on the market during the present season. In this magneto the shuttle type of armature carrying a primary winding is not used, but instead on the driveshaft, which is carried on two ball-bearings, are four wings or rotors made of soft iron laminations; two of the wings are placed at 180 degrees to each other and the other two in a plane at right angles. The magneto shaft carrying these is driven, if by friction or belt, at approximately four times the engine speed and is geared to three times the speed. As the four wings or inductors rotate between the poles of the permanent magnets an alternating current of 7 volts and 9 to 10 amperes is generated in a stationary ribbon coil which stands in a vertical plane at right angles to the inductor shaft and between the rotors. These four wings generate four current impulses per revolution, which current is of the long sine wave type. The copper ribbon winding is insulated by paper, after which it is baked in shellac and entirely protected. In the magneto are used four permanent horseshoe magnets, which are made by the company. These magnets are made from magnet steel with a square cross section. The company buys this steel in long lengths, which is cut to the size required for each magnet, after which the piece is bent into the required shape. This done, the magnet is tempered and quenched in oil, after which it is ready to be magnetized. This company holds patents on this four-wing type of inductor magneto, which it has manufactured for the last two seasons. Magnetos of this nature are used for taking the place of storage cells as current generators and constitute one of the simplest and should be the most durable form of current generator. The current cannot be used for recharging a storage cell in that it is of the alternating type. In installing a magneto it is wired exactly as a set of batteries would be, one wire from it running to the ground and the other to the battery binding post on the coil.



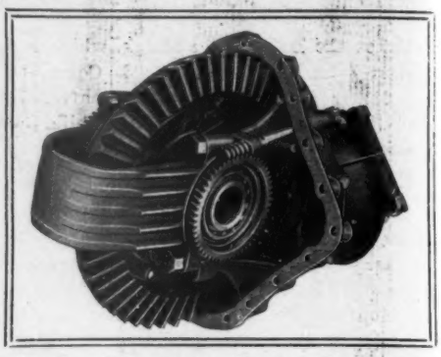
RIBBON WINDING IN K-W MAGNETO

TIMKEN AXLE IMPROVEMENTS

In the new rear axle, manufactured for 1909, by the Timken Roller Bearing Axle Co., Canton, O., and which was described in these pages some weeks ago, a particularly interesting type of differential carrier is used in connection with the axle housing, which is a one-piece affair. The differential carrier, as illustrated, is a compact unit that may be removed bodily from the axle housing without taking down the axle or interfering with the brake equipment, springs, or bearings. The carrier is anchored in the front of the case by a system of slotted nuts and cotter pins. To adjust the bearings a worm and nut are used, the nut being around the bearing cap. The bolt is rigid



FOUR-WING ROTOR IN K-W MAGNETO



TIMKEN DIFFERENTIAL BEARING ADJUSTMENT

with the front of the case and turning it serves to adjust the bearing as desired. By means of this worm gearing either of the bearings can be adjusted from the outside. The brakes used in conjunction with the axle are 14 inches in diameter and 2½ inches wide and are of the expanding and contracting type. The expanding band is pressed steel, actuated by a cam, located diametrically opposite to the anchorage point, with a coil spring for quick releasal. The external band is carried on a double anchorage so that the band floats with the wheel a short distance until the anchor point is reached when pressure on the lever, aided by the attraction of the wheel, applies the friction. The only adjustment in connection with this brake is a large wing nut. The friction surfaces for the expanding and contracting bands are made of asbestos fiber and fine copper wire woven into a solid fabric.

BODY STYLES FOR 1909

The Barndt-Johnstown Auto Supply Co., Columbus, writes Motor Age to the effect that the trend of body styles for next season will be to the straight line type, as compared with the curved, concave and convex types of several years ago. There is a demand for a very small touring car body of the baby tonneau type, which is made interchangeable so that the car may be converted into a runabout. There is also a demand for runabout bodies with individual seats in the rear, so that the car can be arranged for three or four-passenger loads. The general trade wants a smaller and lighter body.

HESS-BRIGHT MAGNETO BEARING

A new Hess-Bright bearing, specially adapted for magneto work, is being put on the market in America by the Hess-Bright Co., Philadelphia, Pa. This new bearing follows the general annular type style, in which the inner race is grooved in the usual way, but the outer race is grooved on one side only, the balls being held in a special steel retainer.